Math at Work 11: Answers

February 20, 2012, 15:57

Answers

Chapter 1

Get Ready, pages 4 to 5

1. a) Examples: millimetre, centimetre, metre, kilometre
b) Examples: the length of a salmon: centimetres; the thickness of a coin: millimetres; the height of an apartment building: metres; the distance from Hopedale, NL, to Montréal, QC: kilometres

2. a) Examples: inch, foot, yard, mile
b) the diameter of a car tire: feet; the distance from Labrador City, NL, to Brandon, MB: miles; the width of a football field: yards; the length of a cell phone: inches

3. a) 450 centimetres **b)** 27.5 centimetres
c) 1.5 kilometres **d)** 180 cm; 1.8 m

4. a) 72 inches **b)** $3\frac{1}{2}$ ft
c) 24 feet **d)** $10\frac{1}{2}'$; 126″

5. Examples:
a) 2 metres **b)** 16 kilometres
c) 8 in. **d)** 10 yards; 30 feet

6. a) $y = 21$ **b)** $y = 25$
c) $y = 22.5$ **d)** $y = 17.5$

7. a) 720 cm^2 **b)** about 63.6 m^2
c) 166 ft^2 **d)** 40 ft^2

8. a) 45 **b)** 42 **c)** 130
d) 36 **e)** 64 **f)** 54

9. a) 5 cm **b)** 16 ft

10. a) $P = 26$ **b)** $V = 70$
c) $h = 12$ **d)** $SA = 8.64$

1.1 Nets and Surface Area of 3-D Objects, pages 6 to 14

On the Job 1 Check Your Understanding, pages 9 to 10

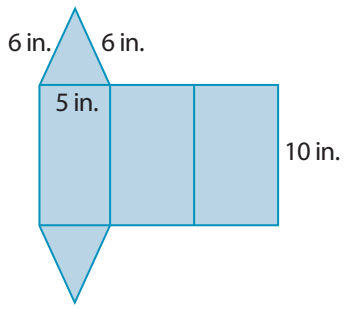
1. a) 192 m^2 **b)** 32 ft^2

2. a) square inches **b)** square miles
c) square yards **d)** square feet

3. 65 ft^2

4. a) square metres **b)** square kilometres
c) square millimetres
d) square centimetres

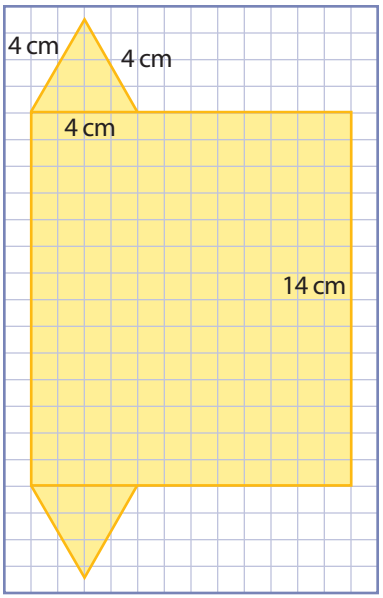
5. a)



b) about 197.5 $in.^2$

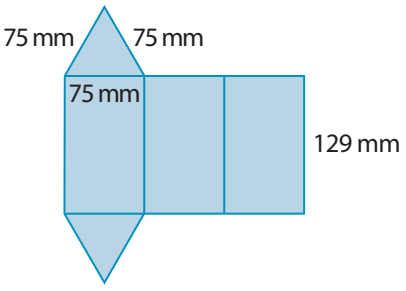
6. 190 ft^2

7. a)



b) about 182 cm^2
c) Example: Extra material is needed for the tabs that are used to glue the sides together.

8. a) 129 mm
b)



c) 33 896 mm^2 **d)** 25 886 mm^2

e) Example: More cardboard is required to make each box.

f) Example: The triangular box could help differentiate between brands of golf balls.

On the Job 2 Check Your Understanding, page 12

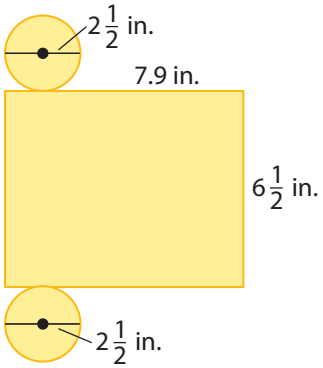
1. a) 804 cm^2 **b)** 201 $in.^2$

2. a) 360 $in.^2$ **b)** 11.515 m^2

3. a) 126 cm **b)** 28 in.

4. 4398 mm^2

5. a)



b) 51 $in.^2$ **c)** 61 $in.^2$

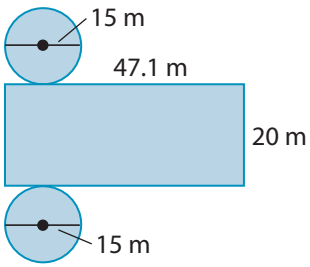
6. a) 2.5 ft^2 **b)** 115 150 cm^2

Work With It, pages 13 to 14

1. a) 1332 $in.^2$

b) No, the surface area does not double; the total surface area is now 2304 $in.^2$

2. a)

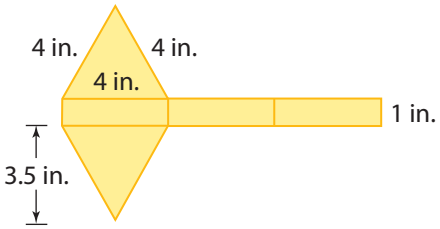


b) 1119 m^2

c) Example: The actual area to be painted on each tank is slightly more than 1119 m^2. When you multiply the rounded answer by 48, the area to be painted is 53 712 m^2. If you multiply by 48 before rounding, the area to be painted is about 53 721 m^2. This difference of about 9 m^2 could be significant when calculating the amount of paint needed.

3. 4444.7 mm^2

4. a)



b) 26 $in.^2$

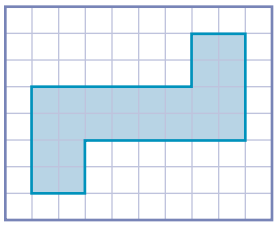
5. Example: A 3-D object can be represented in a 2-D format using a net. The area of the net is the same as the surface area of the 3-D object.

6. Example: The triangular prism may be more resistant to crushing.

7. a) Example: A triangular prism has 5 sides, not 6.

b) If one of the small rectangles is removed from the middle larger rectangle, this net will represent a triangular prism.

8. a)



b) 24 cm^2 **c)** 54 cm^2

1.2 Estimating Surface Area, pages 15 to 24

On the Job 1 Check Your Understanding, pages 19 to 20

1. a) Example: 70 $in.^2$

b) 75 $in.^2$

c) Example: My estimate understated the width of the page by 0.5 in.

2. a) Example: 500 cm^2

b) 475 cm^2

c) Example: My estimate overstated the width of the page by 1 cm.

3. a) Example: 1250 cm^2

b) 26 cm by 45 cm; area: 1170 cm^2

c) Example: My estimate overstated the width by 1 cm, but understated the length by 0.5 cm.

4. a) Examples: 100 m^2; 1000 ft^2

b) Example: 20 L

c) Example: 5 gal

d) Examples: 25 ft by 32 ft by 10 ft high; 7.6 m by 9.8 m by 3 m high; area: 1140 ft^2 or 104.4 m^2; My estimates in both imperial and SI units understated the area of the walls.

5. a) Example: 1000 ft^2

b) Example: The width appears to be about half the length, and the height appears to be about half the length.

6. Example: table top or bottom: 6 ft by 4 ft; table supports: 4 × (0.5 ft by 4 ft, × 2 sides of each support); area = 24 + 24 + 16 = 64; The total surface area is about 64 ft^2.

7. a) Example: 40 cm^2

b) about 43 cm^2

On the Job 2 Check Your Understanding, pages 22 to 23

1. Examples:

a) 18 $in.^2$ **b)** 104 $in.^2$

c) 3 $in.^2$ **d)** $\frac{3}{4}$ $in.^2$

e) 3 $in.^2$ **f)** 30 $in.^2$

2. Examples:

a) 6 ft^2 **b)** 27 ft^2

c) 18 ft^2 **d)** $1\frac{1}{4}$ ft^2

3. a) 12 in. **b)** 144 $in.^2$

c) 6 in. **d)** 36 $in.^2$

e) 72 in. **f)** 36 ft

4. a) 100 cm **b)** 10 000 cm^2

c) 50 cm **d)** 2500 cm^2

e) 5000 cm **f)** 2500 m

5. Examples:

a) 24 cm^2 **b)** 525 cm^2

c) 4 cm^2 **d)** 1.75 cm^2

e) 112 cm^2 **f)** 5 cm^2

6. Examples:

a) 2 m^2 **b)** 75 m^2

c) 2 m^2

7. a) $\frac{1}{4}$ **b)** $\frac{1}{16}$

8. Example: 25 $in.^2$

9. Examples:

a) 110 $in.^2$

b) The surface area must be less than the surface area of ten pucks because there are only 2 round surfaces covered with plastic wrap, not 20.

Work With It, page 24

1. Example: 1740 ft^2

2. Example: 150 $in.^2$

3. Maggie should buy size C because size A will not cover the box and size B will only barely cover the box with no overlap for taping.

4. Example: 5 yd^2

5. Example: The width of a DVD case is about half the width of my watch band. The height of the DVD case is a little more than half the width of a floor tile. The length of the DVD is a little less than half the width of a floor tile. There must be enough plastic wrap to cover all 6 sides of the DVD case, so the total amount needed is about 82 $in.^2$; 2 × (0.5 in. × 7 in.) + 2 × (0.5 in. × 5 in.) + 2 × (7 in. × 5 in.)

6. Example: The circumference of the end of the tube is about 12 in. (4 in. diameter × 3), and the height of the tube is 12 in. Because 12 in. = 1 ft, the wrapper measures about 1 ft^2 (it does not cover the ends of the tube).

7. Example: Ria has to purchase a whole number of boxes. Also, she has estimated the amount of flooring needed, so she would be wise to purchase a bit more to make sure she has enough.

1.3 Using Formulas for Surface Area of 3-D Objects, pages 25 to 39

On the Job 1 Check Your Understanding, pages 28 to 29

1. a) 55 000 cm^2 or 5.5 m^2

b) 32 ft^2

2. a) 100 cm^2 **b)** 600 cm^2

c) 2400 cm^2

d) No. When the side length doubles, the surface area quadruples.

3. a) 36 400 cm^2 **b)** 33 600 cm^2

c) 3.36 m^2

4. 144 ft^2

5. a) 176 $in.^2$

b) Example: If Lori needs an extra 1 in. along each side so that the cut edges are not showing, she will need 216 $in.^2$ of material.

6. 40 100 cm^2 or 4.01 m^2

On the Job 2 Check Your Understanding, pages 31 to 32

1. a) 424 ft^2 **b)** 1520 m^2

2. a) 576 $in.^2$

b) 1056 $in.^2$; No, the surface area does not double.

c) 972 $in.^2$; No, the surface area does not double.

3. 1540 cm^2

4. a) about 1.97″ **b)** about 62.8 $in.^2$

5. 773 cm^2

On the Job 3 Check Your Understanding, pages 34 to 35

1. a) 360 in.^{2} **b)** 224 cm^2
2. 2 m^2
3. a) 8200 mm^2
b) Example: Denial by Cleopatra
4. a) Example: 13 900 mm^2
b) 13 900 mm^2; My prediction was correct.
5. 16 ft^2

On the Job 4 Check Your Understanding, page 37

1. a) 245 cm^2 **b)** 509 in.^{2}
2. 226 in.^{2}
3. 1696.5 cm^2
4. 10 367 ft^2
5. 57 ft^2
6. 11.3 m^2

Work With It, pages 38 to 39

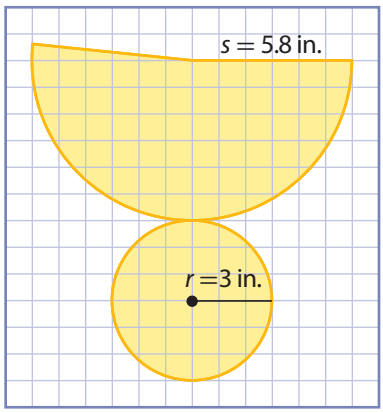
1. 1630 ft^2
2. 1500 ft^2
3. 565 in.^{2}
4. a) 156.5 cm^2
b) Example: The foil would just barely cover the surface area of the cheese, but some overlap is needed to hold the foil in place.
5. 5408 in.^{2} or almost 38 ft^2
6. a) 27 in.^{2} **b)** 4.5 in.^{2}
c) 3 in.
7. a) 353.8 cm^2 **b)** 249.3 cm^2
c) The surface area of the can does not double, but the surface area of the label does double.
8. Example: The surface area of an object is the total area of all exterior surfaces of the object.
9. Disagree; the volume of a box is equal to how much it will hold.
10. Example: Surface area is a 2-D property of a 3-D object. A net of a 3-D object is a 2-D representation of that object used to calculate surface area.
11. Yes. Because the triangular ends are equilateral triangles, the width is equal to the base of the triangle.

1.4 Surface Area of Cones and Spheres, pages 40 to 49

On the Job 1 Check Your Understanding, page 45

1. a) 26.9 cm **b)** 5.8 in.

2.



3. a) 314.2 cm^2 **b)** 28.3 in.^{2}
4. a) 845.1 cm^2 **b)** 54.7 in.^{2}
5. a) 1159.3 cm^2 **b)** 83.0 in.^{2}
6. 585.0 cm^2
7. a) 8 in. **b)** 38 in.^{2}

On the Job 2 Check Your Understanding, pages 47 to 48

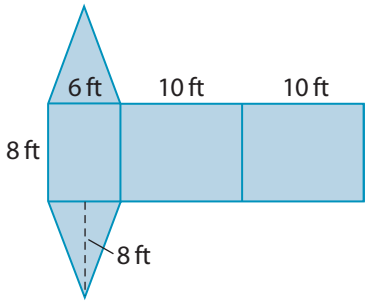
1. a) 1256.6 cm^2
b) 615.8 in.^{2}
2. a) 5026.5 cm^2; No, the surface area has quadrupled.
b) 2463.0 in.^{2}; No, the surface area has quadrupled.
3. a) 6361.7 cm^2
b) Example: I am 6 ft tall; 13 273.2 cm^2
4. 142 753 970 mi^2
5. 5809 mm^2

Work With It, pages 48 to 49

1. a) 333.9 cm^2 **b)** 5009 cm^2
2. 452.4 in.^{2}
3. 6754.4 mm^2
4. The cylinder has the greater surface area. Assume that each base has a diameter of 3 cm, and each height is 4 cm. The surface area of the cylinder is about 52 cm^2. The surface area of the cone is about 27 cm^2.
5. The cylinder has the greater surface area.
6. a) The formula $SA = \pi rs$ should be used when calculating the surface area of a cone with no base.
b) The formula $SA = \pi r^2 + \pi rs$ should be used when calculating the surface area of a cone with a base.

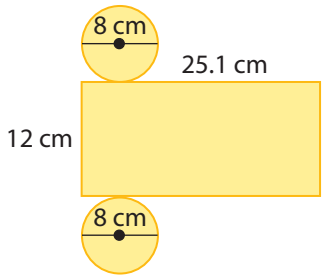
Chapter 1 Skill Check, pages 50 to 51

1. a)



b) 256 ft^2

2. a)



b) 402.1 cm^2

c) Example: When the height of a can is doubled, the area of the middle section of the can is doubled, but the area of the ends is unchanged.

3. Example: surface area of bookcase: 6.6 m^2

4. Example: surface area of bookcase: 70 ft^2

5. a) 265 in.^{2}

b) Example: A wrapper with surface area 265 in.^{2} would just barely cover each face of the stack of paper. The wrapper would likely be slightly larger to allow for overlapping so that the wrapper can be affixed securely.

6. 477.5 cm^2

7. 1740 cm^2

8. 6500 mm^2

9. a) 201.1 cm^2

b) Example: This calculation assumes that the cone diminishes to a point, but it diminishes only to the point where the diameter of the cone measures 1 cm.

10. 14 in.^{2}

Chapter 1 Test Yourself, pages 52 to 53

1. C

2. D

3. a) cube **b)** triangular prism

c) cylinder

4. 24 208 cm^2

5. a) 384 in.^{2}

b) No, the area does not double. Only four of the six sides have doubled in area.

6. about 49.8 ft^2

7. John calculated the area of the cup as if the cone diminished to a point (with no bottom).

8. a) 177 952.4 mm^2 **b)** 1779.5 cm^2

Chapter 2

Get Ready, pages 58 to 59

1. a) 2 **b)** 2 **c)** 100

d) 5 **e)** 32 **f)** 32

g) 700 **h)** 800

2. a) 4 **b)** 6 **c)** 8

d) 27 **e)** 5 **f)** 125

3. a) 24 ft **b)** 35 ft^2 **c)** No

d) Yes **e)** perimeter: 38 ft; area: 70 ft^2

4. a) 80 cm **b)** length: 9 m; width: 4.2 m

c) each side length: 9″

d) each side: 4″

5. a) $a = 8$ in. **b)** $c = 6.5$ cm

6. a) $10\frac{1}{2}$ ft^2 **b)** 12.6 m^2

7. a) 154 m^2 **b)** 113 m^2

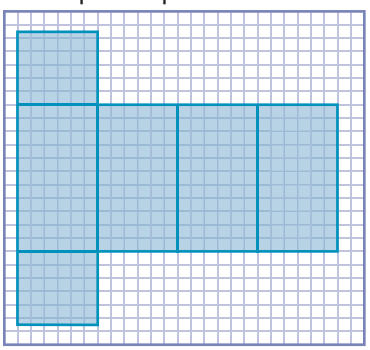
8. 80 ft^2

9. a) cylinder **b)** cube

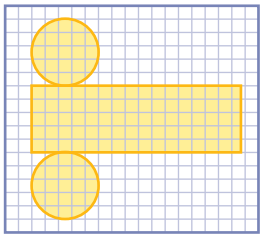
10. a) estimate: 55 m^2; actual: 58.4 m^2

b) estimate: 450 cm^2; actual: about 471 cm^2

11. a) 1 square represents 0.4 m



b) 1 square represents 2 cm



2.1 Working With Scale, pages 60 to 71

On the Job 1 Check Your Understanding, pages 64 to 65

1. 4 in. and 6 in.

2. **a)** 1 : 100 **b)** 1 : 12
c) 1 : 100 000 **d)** 1 : 48

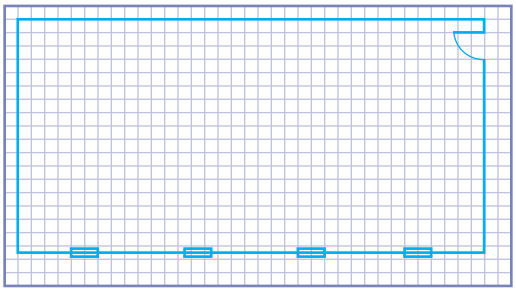
3. **a)** 410 cm **b)** 154 cm
c) 147 cm **d)** 36 cm

4. 85 ft 4 in.

5. **a)** 2 ft **b)** 3 ft
c) 12 ft

6. Example:

1 square represents 2 feet



7. 504 tiles

On the Job 2 Check Your Understanding, pages 68 to 69

1. **a)** A = 16.2 cm, B = 14.1 cm
b) $C = 4\frac{1}{4}''$, $D = 7\frac{1}{2}''$

2. **a)** 153.2 cm
b) 47″

3. **a)** E = 2′ 11″
b) F = 14.1 cm

4. The perimeters cannot be calculated without knowing the lengths of the other sides.

5. No. The height of the dress above the waistband is $6\frac{1}{2}''$, but the decal is $6\frac{3}{4}''$ high, so it will not fit.

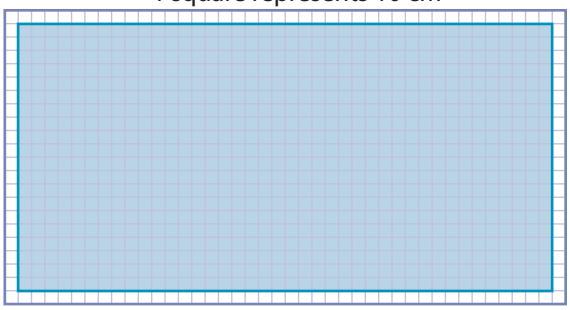
6. height: 5 ft 4 in., length: 5 ft 10 in.

7. 811.5 ft^2

Work With It, pages 70 to 71

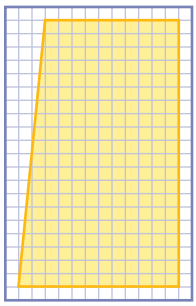
1. **a)**

1 square represents 10 cm

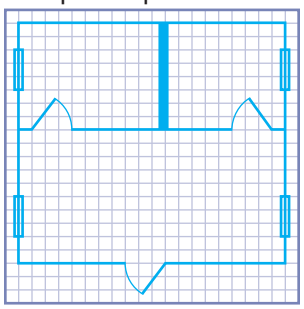


b)

1 square represents 10 cm



2. **a)** bedroom 1: 8′; bedroom 2: 8′ 10″
b) 1 square represents 1 ft



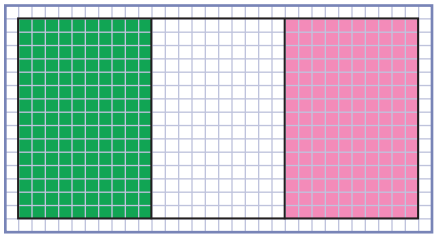
3. **a)** 2 squares **b)** 6.5 m by 3 m
c) 19.5 m^2 **d)** 1.675 m^2

4. Examples: Add up the wall space in metres, and multiply by 0.1 m (10 cm); calculate the area of the carpet on each wall, and add them together.

5. a) The width is two times the height.

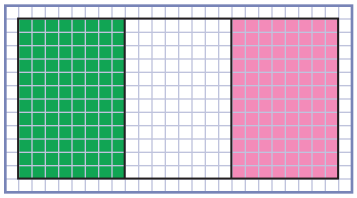
b) Example:

1 square represents 1 cm

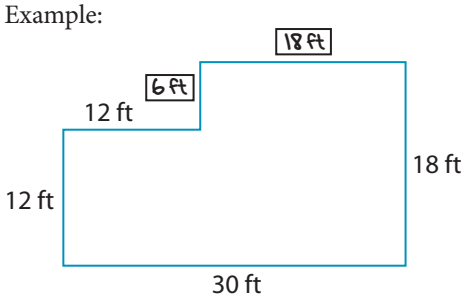


c) Example:

1 square represents 0.25 in.



6. Example:



7. Example: The architect may want to show the advantages of his design over other designs.

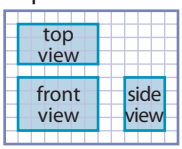
2.2 Representing Views of 3-D Objects, pages 72 to 83

On the Job 1 Check Your Understanding, pages 76 to 77

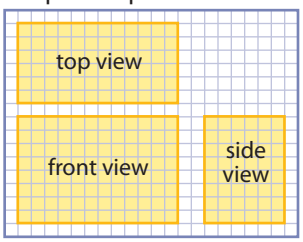
1. front view: 6 m by 4 m; side view: 3 m by 4 m; top view: 6 m by 3 m

2.

1 square represents 1 m



3. 1 square represents 50 cm



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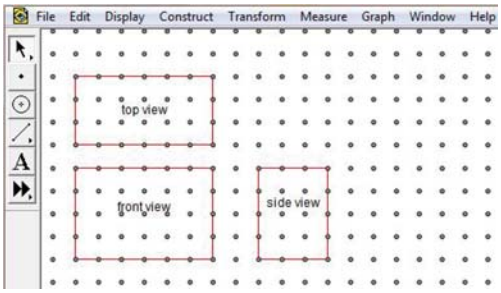
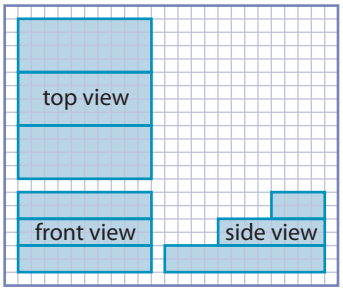
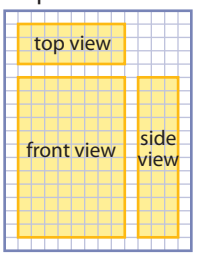


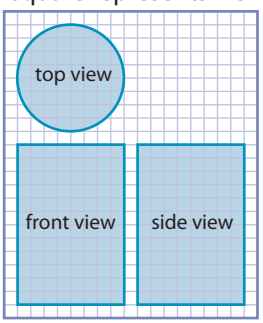
5. 1 square represents 10 cm



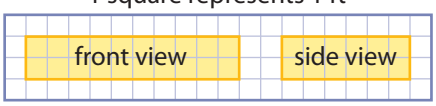
6. 1 square represents 1 in.



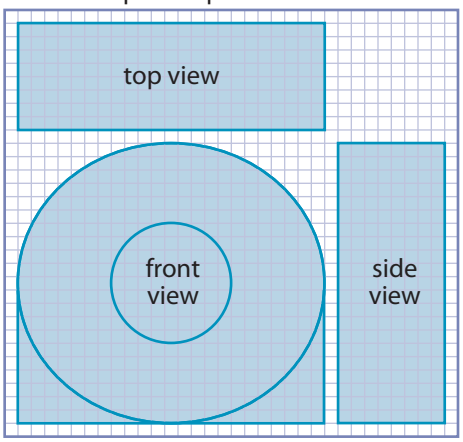
7. 1 square represents 1 cm



8. 1 square represents 1 ft

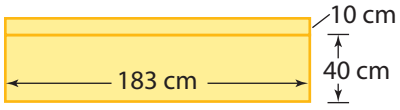


9. 1 square represents 10 cm

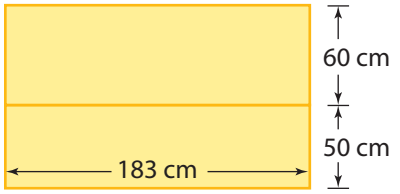


10. a) No. The front and top views are incorrect.

b)



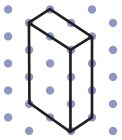
top view



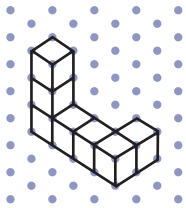
front view

On the Job 2 Check Your Understanding, page 81

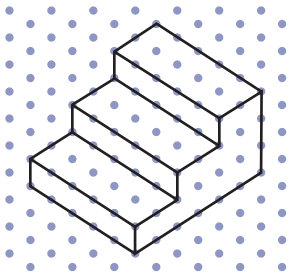
1. b)



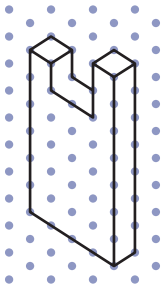
2.



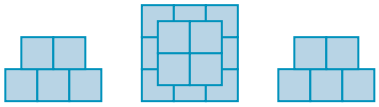
3.



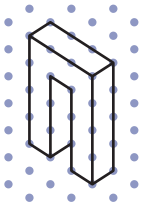
4. b) Example:



5.

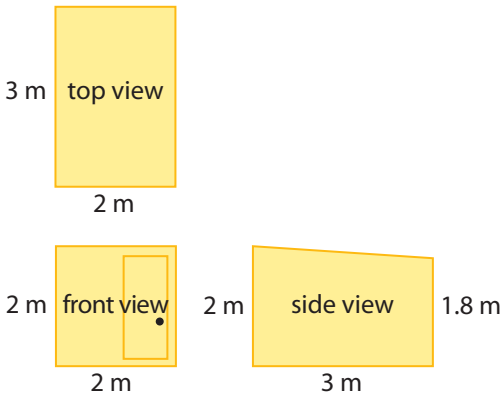


6.

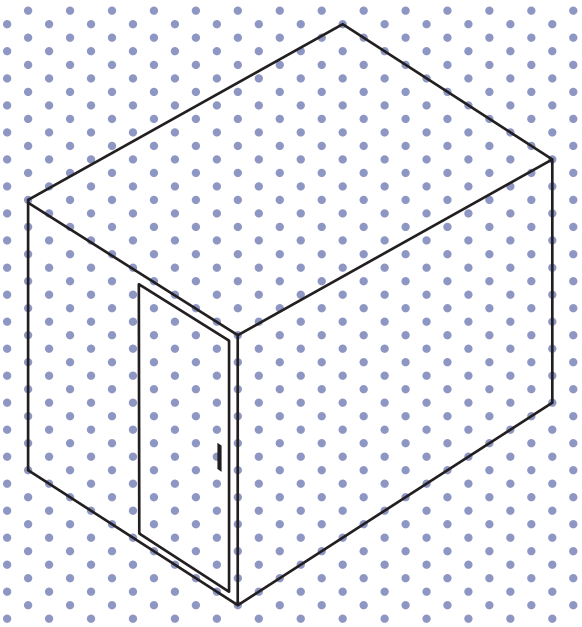


Work With It, pages 82 to 83

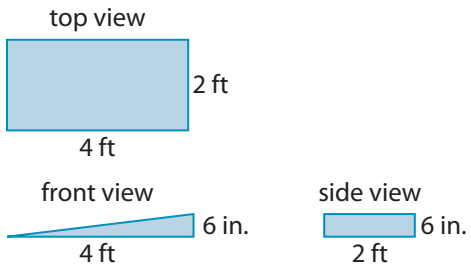
1. a)



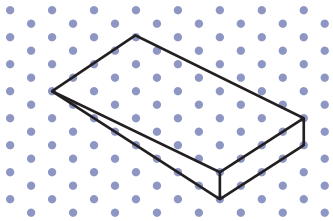
b)



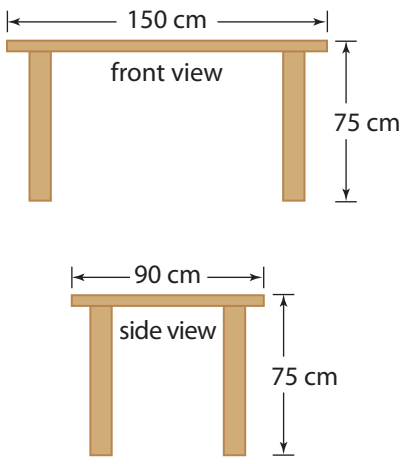
2. a)



b)

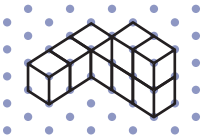


3. a)

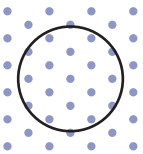


b) The top view would be a rectangle measuring 150 cm by 90 cm.

4. b)



5.



A circle drawn on isometric dot paper looks like a sphere. Drawings on isometric dot paper look 3-D because they show the front, top, and side views, when looking at the object from an angle. A sphere looks the same from the front, top, side, or from an angle.

6. Since the middle part of a cylinder (surface) is curved, it looks the same from the front, side, back, or any angle in between.

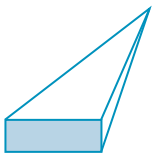
7. Example: The top right side measures 4 cubes, while its opposite side measures only 3 cubes; the top left side measures 4 cubes, while its opposite side measures 5 cubes.

8. Example: Surveyors use scale diagrams to determine property lines and exact locations of structures; architects use scale diagrams to position walls and supports properly; car designers use scale diagrams to show how new designs will look.

2.3 Representing Perspectives of 3-D Objects, pages 84 to 90

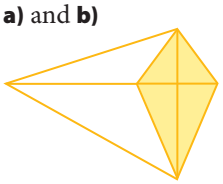
On the Job 1 Check Your Understanding, pages 88 to 89

1. b) and **c)**



d) Example: No. It looks like a triangular prism on its side.

2. a) and **b)**

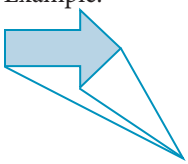


c) The point of perspective is to the left of the object because the left sides of the object are visible.

3. a) arrow

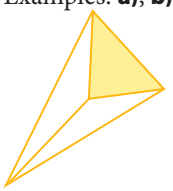
b) The point of perspective is up and to the left.

c) Example:



d) Example: The point of perspective is down and to the right.

4. Examples: **a)**, **b)**, and **c)**



d) a triangular prism

e) The point of perspective is down and to the left of the original triangle.

5. a) to the left

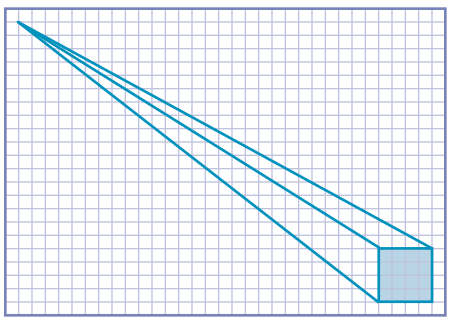
b) up and to the right

c) below

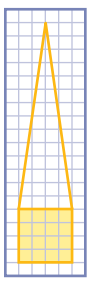
d) above

6. Examples:

a)

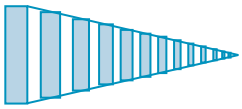


b)

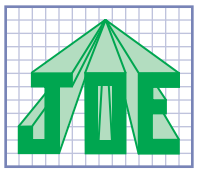


c) Yes. In the second drawing, only the top and front sides of the prism are visible, whereas the top, front, and side views of the prism are visible in the first drawing. The first drawing is a better 3-D representation of the same prism because it shows three views of the object.

7. Example:

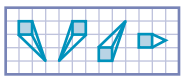


8. Example: **a)**, **b)**, and **c)**



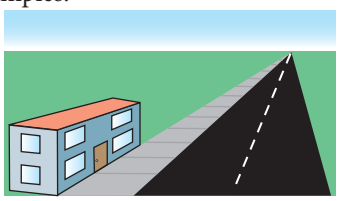
d) The point of perspective is centred directly above the name.

9. Example:



10. Examples:

a)



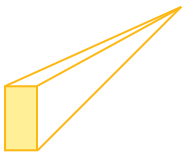
b) The road, sidewalk, house, door, and windows all converge on a single vanishing point.

11. Examples:

a)

b)

c)



d) The two drawings are similar because they both represent rectangular prisms with a face twice as tall as it is wide. The drawings are different because the first drawing shows precisely how deep the rectangular prism is, whereas the rectangular prism in the second drawing appears to be very deep.

On the Job 2 Check Your Understanding, pages 93 to 94

1. a) set of door knobs b) 4

2. a) fan

b) Examples: B: front cover, D: blades, M: motor, T: base

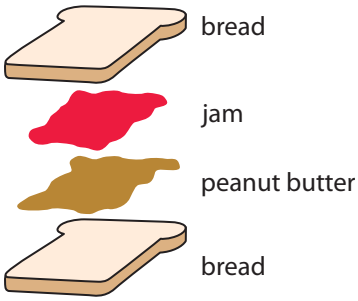
3. c) 1 square represents 2 cm

4. Examples:

a) 2 slices of bread, peanut butter, jam

b) bottom slice of bread, peanut butter, jam, top slice of bread

c)

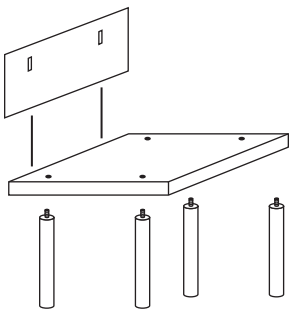


5. Examples:

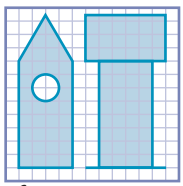
a) chair: four legs, seat, back, two back supports, two securing screws

b) Step A: Screw the four legs into the predrilled holes in the bottom of the seat. Step B: Screw the two back supports into the predrilled holes in the top of the seat. Step C: Slide the two slots in the back of the chair over the two back supports. Step D: Screw the two securing screws into the predrilled holes in the back to secure the back to the supports.

c)



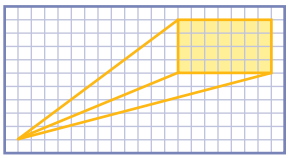
6.



Work With It, page 95

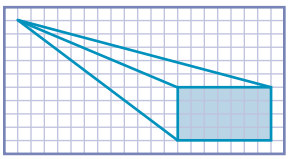
1. Examples:

a) and **b)**



c) down and to the left of the bus

d)



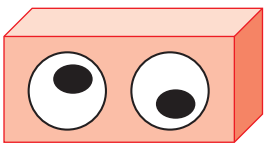
e) up and to the left of the bus

2. Example:

3. Example:

4. Examples:

a)



b) isometric drawing

5. Example: showing the construction of a piece of furniture

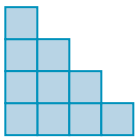
6. Example: The location of the vanishing point gives the perspective point. For example, a vanishing point that is up and to the right of the object has a point of perspective that is up and to the right.

Chapter 2 Skill Check, pages 96 to 97

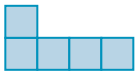
1. A: 7 m, B: 2.5 m, C: 2 m

2. a) 256 cm **b)** $3\frac{3}{4}$ in.

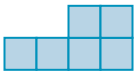
3.



top view

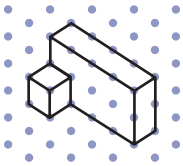


front view



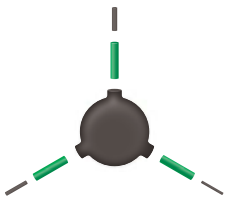
side view

4. b)



5. Example:

6.



Chapter 2 Test Yourself, pages 98 to 99

1. D

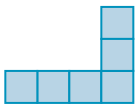
2. B

3. C

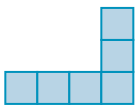
4. A

5. D

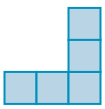
6.



top view

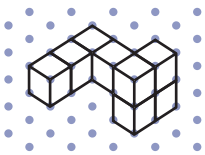


front view



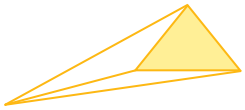
side view

7.



8. Examples:

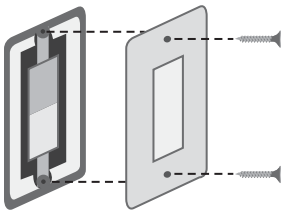
a)



b) down and to the left of the object

9. a) Step A: Hold the plate against the light switch.
Step B: Screw the screws into the receptacle box holes.

b)



Chapter 3

Get Ready, pages 104 to 105

1. a) 9750 cm^2 **b)** 24 ft^2
c) about 380 cm^2 **d)** 1086 ft^2

2. a) 220 centimetres **b)** 0.85 metres
c) 10 000 metres **d)** 440 cm; 4.4 m

3. a) 0.5 m × 0.5 m = 0.25 m^2
b) 0.1 m × 0.1 m = 0.01 m^2
c) 1 m × 1 m = 100 cm × 100 cm = 10 000 cm^2
d) Example: 5 m × 5 m = 500 cm × 500 cm = 250 000 cm^2

4. a) 0.5 feet **b)** 30 inches
c) 5 feet 8 inches **d)** 250″
e) 30 feet

5. a) 0.5 ft × 0.5 ft = 0.25 ft^2
b) 1 ft × 1 ft = 12 in. × 12 in. = 144 $in.^2$
c) 1 yd × 1 yd = 3 ft × 3 ft = 9 ft^2

6. a) 1000 millilitres **b)** 2000 mL
c) 0.5 L **d)** 0.25 L

7. 12 L

8. a) $\frac{3}{2}$ **b)** $\frac{3}{4}$ **c)** $\frac{17}{4}$
d) $\frac{1}{4}$ **e)** $\frac{1}{8}$ **f)** $\frac{1}{16}$
g) $\frac{1}{8}$

9. a) 64 **b)** 289 **c)** 0.04
d) 0.0121 **e)** $\frac{1}{4}$ **f)** $\frac{25}{81}$

10. a) 125 **b)** 1000
c) 0.064 **d)** 0.000 008
e) $\frac{1}{27}$ **f)** $\frac{125}{729}$

11. a) 10 **b)** 12 **c)** 25
d) 50 **e)** 125 **f)** 250

12. a) $P = 38$ **b)** $w = 12$
c) $A = 30$ **d)** $b = 20$

3.1 Volume, pages 106 to 117

On the Job 1 Check Your Understanding, pages 110 to 111

1. a) rectangle **b)** 20 ft^2
c) 60 ft^3

2. a) Volume of a rectangular prism = length × width × depth
b) Yes, the answer is the same.

3. 30 m^3

4. a) triangle **b)** 30 cm^2
c) 210 cm^3

5. a) Volume of a triangular prism $= \frac{\text{length} \times \text{width} \times \text{depth}}{2}$
b) Yes, the answer is the same.

6. 5184 $in.^3$

7. a) 79 cm^2 **b)** 474 cm^3

8. a) 37.7 ft^3 **b)** 1.4 yd^3

9. 4 ft

10. 3 m

11. a) 30 000 ft^3 **b)** 1111 yd^3

12. 3.4 m^3

13. slightly more than 2 bags

14. a) 720 $in.^3$
b) Example: The volume is likely less than 1 cubic foot. The height of the base is only half a foot, the depth of the prism is only $\frac{2}{3}$ of a foot, and a triangular prism with measurements 1 ft × 1 ft × 2 ft has a volume of 1 cubic foot.
c) 0.4 ft^3
d) Example: Yes. Although two of the measurements are less than a foot, one measurement is 2.5 feet.

On the Job 2 Check Your Understanding, pages 114 to 115

1. a) Example: 1440 $in.^3$
b) 1501.5 $in.^3$; I underestimated the volume.

2. a) Example: 1125 cm^3
b) 1113.75 cm^3; I overestimated the volume by about 11 cm^3.
c) Example: 1350 cm^3; I overestimated the volume by about 236 cm^3.

3. Examples:
a) 30 m^2 **b)** 3 m^3

4. about 42 ft^3

5. Examples:
a) 300 m^3 **b)** 10 000 ft^3
c) 370 yd^3

6. a) Example: 3 m^2 **b)** Example: 0.3 m^3
c) 1 bag

7. Examples:
a) 4 ft × 1.5 ft × 2 ft **b)** 12 ft^3

Work With It, pages 116 to 117

1. a) 2448 ft^3 **b)** 19 loads

2. 43 ft^3

3. 0.5 m^3

4. Example: 2.3 yd^3

5. Example: 4.5 ft^3

6. a) 144.16 m^3 **b)** about 48 min

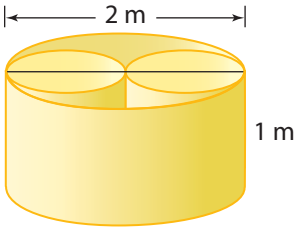
7. Examples: Accurate measures of volume are required when baking a cake, whereas estimates are satisfactory when calculating the amount of mulch to put on a flower bed.

8. Example: Surface area is the sum of the areas of all surfaces of the box; surface area is a 2-D representation of a 3-D object. Volume is the total amount of air, water, or another substance required to fill the 3-D object, so volume is a 3-D representation. These representations are measured in square units (units^2) and cubic units (units^3), respectively.

9. a) Volume; It asks for the 3-D amount of foam chips required to fill a carton.
b) Surface area; It asks for the 2-D amount of spray paint required to cover the surfaces of a vase.

10. a) The volume should be less than 1 m^3 because the cylinder would fit inside a cube with side lengths of 1 m, with room to spare.
b) 0.8 m^3; The prediction was correct.
c) Yes, doubling the height would double the volume. If there were two identical cylinders, each would have a volume of 0.8 m^3. Stacking the two cylinders would create a cylinder with double the height and double the volume.

d) No, doubling the diameter would not double the volume. The sketch below shows that the volume of a cylinder with double the diameter is much more than double the volume of the smaller cylinder.



3.2 Volume and Capacity, pages 118 to 127

On the Job 1 Check Your Understanding, pages 121 to 122

1. Examples:
a) fluid ounces **b)** gallons
c) quarts **d)** fluid ounces

2. Examples:
a) millilitres **b)** litres
c) litres **d)** millilitres

3. a) 8 qt **b)** 12 qt
c) 40 qt **d)** 80 qt

4. a) 16 fl oz **b)** 4 fl oz **c)** 32 fl oz
d) $1\frac{1}{2}$ cups **e)** $\frac{1}{4}$ cup **f)** 5 cups

5. a) 8 cups **b)** 2 cups **c)** 12 cups
d) 32 fl oz **e)** 64 fl oz **f)** 128 fl oz

6. $16\frac{2}{3}$ bottles

7. a) 20 qt
b) Example: Based on a cost of $1.20 per litre, it should cost about $24 to fill the motorcycle.

8. a) Example: The capacity of 18.9 L might be an approximation; perhaps the bottle has a capacity of 20 qt.
b) 18.9 L **c)** 9.45 L

9. a) 2 qt **b)** US$1.00

On the Job 2 Check Your Understanding, pages 124 to 125

1. Examples:
a) 125 mL **b)** 750 mL

2. Examples:
a) 375 mL **b)** 250 mL

3. a) 2 L **b)** 1.5 L

4. Step 1: about 40 mL; about $1\frac{1}{3}$ fl oz
Step 2: about 115 mL; almost 4 fl oz
Step 3: Examples: pen: about 12 mL; about $\frac{1}{3}$ fl oz; eraser: about 11 mL; about $\frac{1}{3}$ fl oz
Step 4: Examples: An object of similar size to a pen or eraser will have a volume of about $\frac{1}{3}$ fl oz, and an object of similar size to a hockey puck will have a volume of about 115 mL.

5. 20 mL

6. 460 mL

7. Step 4: Examples: These estimates can be useful in cooking, measuring plant food, or measuring dry detergent.

8. Examples: She can approximate three half-teaspoons, or she can approximate $1\frac{1}{2}$ five-millilitre measures.

Work With It, pages 126 to 127

1. a) She should bring the 10-gallon urn because 9 fl oz of coffee for 90 guests totals 810 fl oz. Converted to gallons, this totals about 6.3 gal.
b) If the number of guests doubles, she should bring both coffee urns.

2. a) 6.4 qt **b)** 6 L **c)** 36 L
d) 144 L **e)** 52 560 L

3. a) 5 cups
b) Examples: $2\frac{1}{2}$ pt; $1\frac{1}{4}$ qt

4. a) Example: about 8 cm^3
b) Example: about 56 cm^3

5. Example: spreading topsoil on a garden

6. Example: baking a cake

7. Example: converting fluid ounces to quarts to estimate the capacity in litres

8. The capacity is how much water the bathtub will hold; the volume of the bathtub is how much water is in the bathtub.

9. Examples: Others may have more accurate personal references.

3.3 Using Formulas for Volume and Capacity, pages 128 to 136

On the Job 1 Check Your Understanding, pages 131 to 132

1. a) 565 cm^3 **b)** 314 $in.^3$

2. a) 1695 cm^3 **b)** 942 $in.^3$

3. a) 1131 cm^3 **b)** two times greater

4. a) 1257 $in.^3$ **b)** four times greater

5. a) 22 cm **b)** 19 in.

6. a) 16 m^3 **b)** 192 $in.^3$

7. 1676 m^3

8. 44 $in.^3$

9. Yes, there are almost 8.4 yd^3.
10. 32 ft^3
11. 15 379 m^3

On the Job 2 Check Your Understanding, pages 134 to 135

1. a) two rectangular prisms
b) two half-cylinders and a rectangular prism
c) a rectangular prism and a triangular prism
d) rectangular prisms
2. 6600 cm^3
3. 9903.5 $in.^3$
4. a) 2.4 m^3 **b)** 1.6 m^3
5. 13 632 ft^3
6. 1680 ft^3
7. a) 225 ft^3 **b)** about 240 ft^3
c) about 15 ft^3

Work With It, page 136

1. a) 184 cm^3
b) No, because the flavoured ice is mounded higher than the lip of the cup.
2. 381 704 ft^3
3. 1767 cm^3
4. a) The inside measurements give the volume of grain that can be stored in the silo.
b) If outside measurements were used, the thickness of the walls of the silo would be included in the volume.
5. Example: Yes. This is a good strategy as long as Brittney realizes that her estimate will be more than the actual volume.
6. Since the radius is squared in the calculation of volume of a cone, multiplying the radius by 2 results in a 2^2 times increase in the volume.

3.4 Volume and Capacity of Spheres, pages 137 to 143

On the Job 1 Check Your Understanding, pages 140 to 141

1. a) 33 510 cm^3 **b)** 113 ft^3
2. a) 1437 $in.^3$ **b)** 905 cm^3
3. 0.033 51 m^3
4. about 0.8316 ft^3
5. 24 429 m^3
6. a) about 268 cm^3
b) Example: 2144 cm^3; When the radius is doubled, the volume should be 2^3 times the original volume.
c) about 2145 cm^3
d) The volume is 8 times the original volume, because doubling the radius results in 2^3 times the original volume.
7. a) 3145 mm **b)** 16 287 730 cm^3

Work With It, pages 142 to 143

1. about 382 $in.^3$
2. a) 11.9 cm **b)** 7058.8 cm^3
c) 23.6 cm **d)** 6882 cm^3
3. a) 78.5 cm^2 **b)** 65.4 cm^3
c) Example: SA: 20 cm^2; V: 8 cm^3
d) $SA = 19.6\ cm^2$; $V = 8.2\ cm^3$
e) Example: The surface area of the smaller ball is a $\frac{1}{4}$ of the surface area of the larger ball. The volume of the smaller ball is $\frac{1}{8}$ of the volume of the larger ball.
f) Example: The radius is squared to calculate surface area, so when the radius is halved, the surface area is divided by 4. The radius is cubed to calculate volume, so when the radius is halved, the volume is divided by 8.
4. a) 24.5 $in.^3$
b) Example: There could be an air space in a scoop of ice cream.
5. Example: The calculated capacity assumes that there is nothing else in the fishbowl, that is, no fish, stones, or decorations.
6. Example: The formula for the volume of the new sphere is $V = \frac{4\pi(2r)^3}{3}$ or $V = \frac{4\pi(2^3)r^3}{3}$ or $V = (8)\frac{4\pi r^3}{3}$.
7. Example: If the volume is known, the radius can be calculated by the following formula: $r = \sqrt[3]{\frac{3V}{4\pi}}$. If a sphere has a volume of 493 cm^3, the radius measures about 4.9 cm.

Chapter 3 Skill Check, pages 144 to 145

1. 1100 cm^3
2. a) 440 000 ft^3 **b)** 16 296 yd^3
3. a) 4 quarts **b)** 2 pints
c) 2 cups **d)** 8 fluid ounces
e) 128 fluid ounces
4. a) 32 fl oz **b)** 1 L
5. Examples:
a) 500 mL **b)** 1.5 L
6. about 27 in.
7. 5184 cm^3
8. 6336 ft^3

9. 157 cm^3

10. a) about 143 793 cm^3

b) Example: No. The volume of air will be less than the answer to part a) because the thickness of the skin of the ball was not considered.

Chapter 3 Test Yourself, pages 146 to 147

1. D

2. B

3. C

4. A

5. B

6. B

7. C

8. a) 15 607 $in.^3$ **b)** 220 qt

9. 2 fl oz

10. 942.5 cm^3

11. Example: 1.8 m^3

12. a) 860 ft^3 **b)** 11 min

Chapter 4

Get Ready, pages 152 to 153

1. a) 88% **b)** 90% **c)** 96%
d) 44% **e)** 83% **f)** 85%

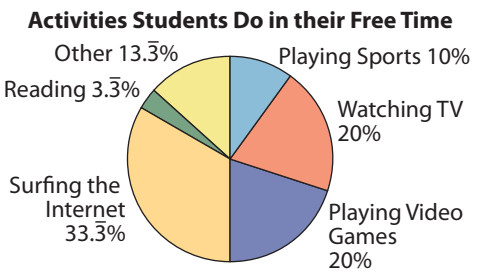
2. Examples:
a) 100 **b)** 38 **c)** 230
d) 1 **e)** 68 **f)** 30

3. a) 99 **b)** 38.25 **c)** 234.85
d) 1.36 **e)** 65.28 **f)** 31.5

4. a) 40% **b)** $1000 **c)** $375
d) $250

5. a) Playing sports: 10%; Watching TV: 20%; Playing video games: 20%; Surfing the Internet: 33.$\overline{3}$%; Reading: 3.$\overline{3}$%; Other:13.$\overline{3}$%

b)

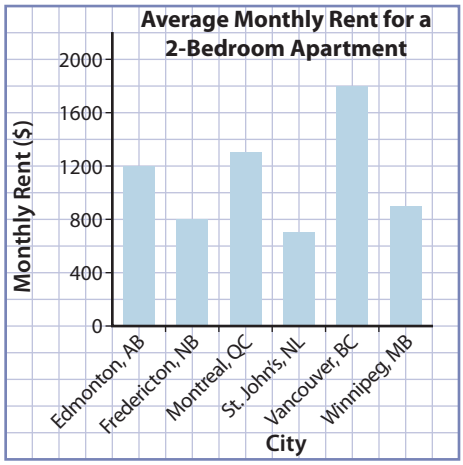


6. a) food server, tour guide, farm labourer, tutor, landscaper, mechanic

b) tutor

c) tour guide

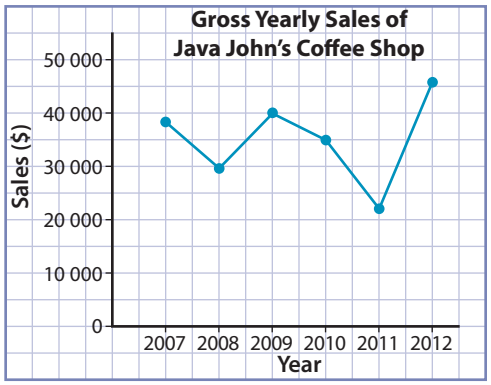
7.



8. a) 2008 **b)** domestic cars

c) Sales of domestic cars are higher than sales of imported cars.

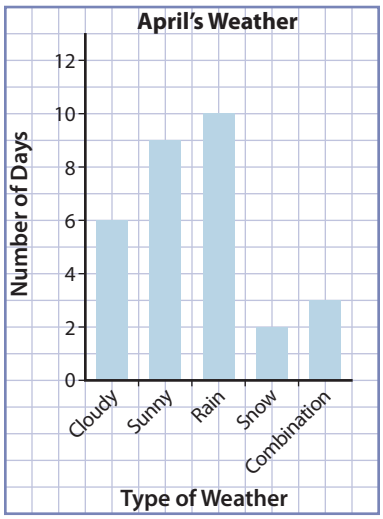
9.



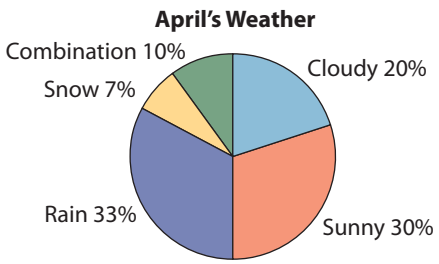
4.1 Choosing a Graph, pages 154 to 167

On the Job 1 Check Your Understanding, pages 158 to 159

1. a)

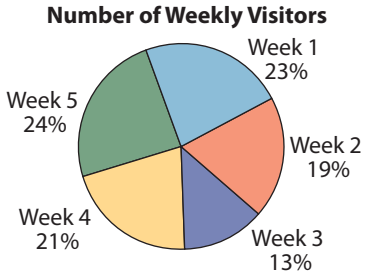


b)



2. Example: The bar graph is most appropriate because it clearly shows the declining caribou population each year.

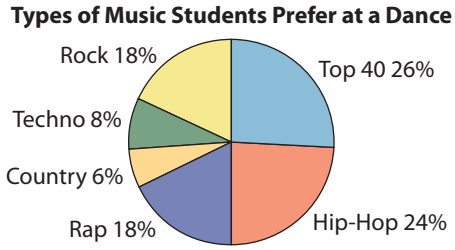
3. circle graph;



4. Examples:

a) circle graph

b)



c) No, the number of students who voted for each category is not easily shown; the percent of the total number of students is easier to see.

d) Advantage: The percent of students who voted for each category is easy to see. Disadvantage: The total number of students who voted for each category is not apparent.

5. Examples:

a) 3.4 times

b) I used the circle graph because it clearly shows that 34% of the movie rentals were comedies and 10% of the movie rentals were dramas.

c) romance and action movies

d) I used the bar graph because it shows that romance and action movies were rented about the same number of times.

e) Peter should divide his $15 000 according to the percents for each category shown on the pie chart.

f) Drama: $1500; Comedy: $5100; Romance: $3450; Action: $3000; Mystery: $1950

On the Job 2 Check Your Understanding, pages 163 to 165

1. Examples:

a) Yes. A line graph shows the continuous growth of the plant over time.

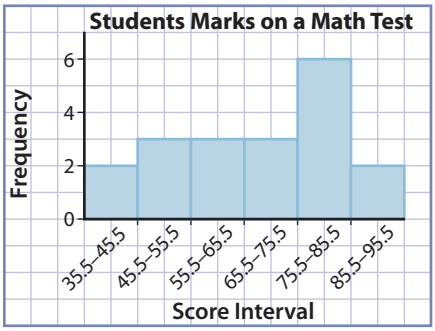
b) No. A bar graph is more appropriate because it shows his earnings each pay, so he can easily compare them.

c) Yes. A histogram shows the number of people in each interval with a specific range of heart rates.

2. a)

Score Interval	Tally	Frequency
35.5–45.5	||	2
45.5–55.5	|||	3
55.5–65.5	|||	3
65.5–75.5	|||	3
75.5–85.5	𝍸 |	6
85.5–95.5	||	2

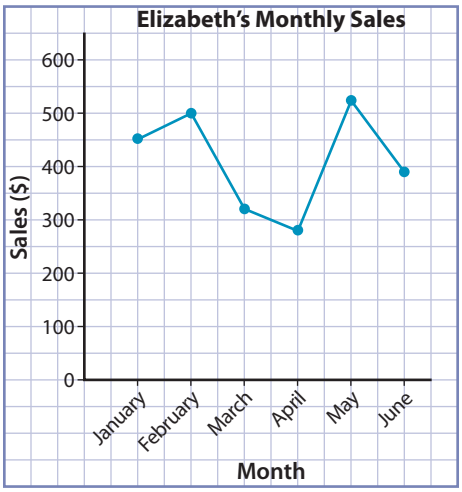
b)



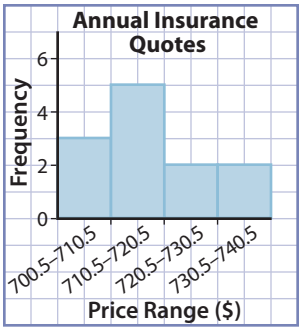
c) 75.5–85.5

3. a) continuous

b)



4. a)



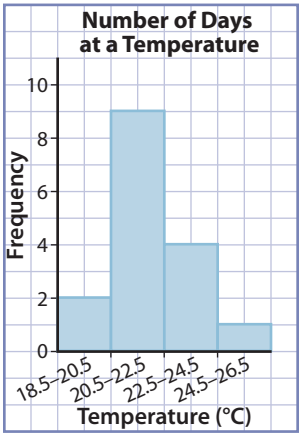
b) He should expect to pay between $710.50 and $720.50, because that category has the most quotes.

c) Example: A circle graph using the same ranges could be used.

5. a) Example: Yes. The data spans time, and the transition period between categories is implied by the line.

b) about 11% **c)** about 8% more

6. a)



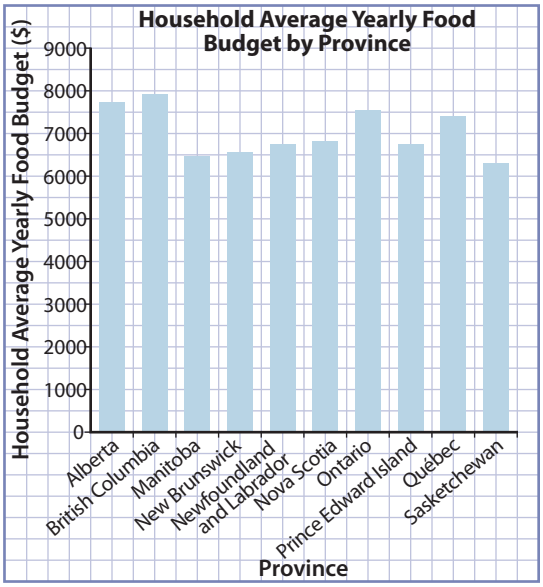
b) Example: I chose a histogram because it shows the frequency of each range.

c) Example: Madison could tell the student that about 31% of the days had a temperature higher than 22 °C.

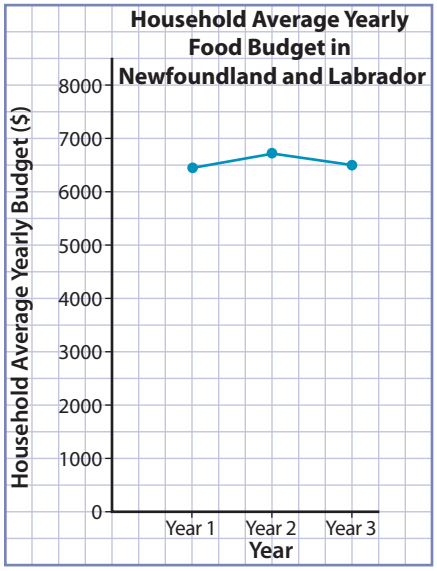
d) Example: A circle graph would show that 31% of the days had a temperature higher than 22 °C, but Madison would have to reorganize her data to accurately answer the student's question.

7. Examples:

a)



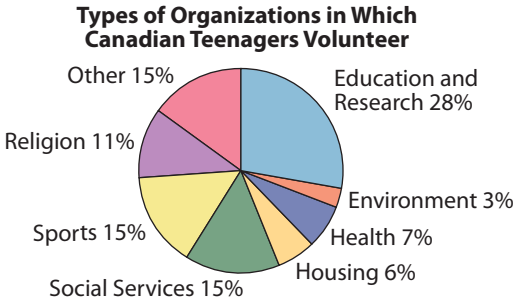
b)



c) Different values are easy to compare on a bar graph, and a line graph implies the increasing or decreasing values over time.

Work With It, pages 166 to 167

1. a) Example:



b) Example: Advantage: A circle graph shows the percent of volunteers that choose each type of organization. Disadvantage: It does not show the number of volunteers that choose each type of organization.

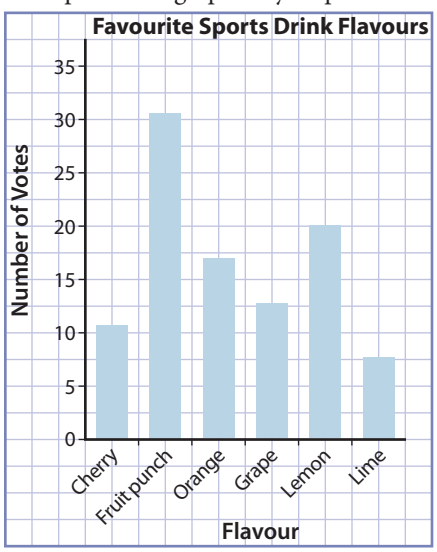
c) 66 students

2. a) bar graph

b) No. The graphs only show the total number of views for lacrosse in the month, not the number of views on each day.

3. a) The data are discrete because each flavour is independent of the others.

b) Example: A bar graph may be preferred.



4. Examples:

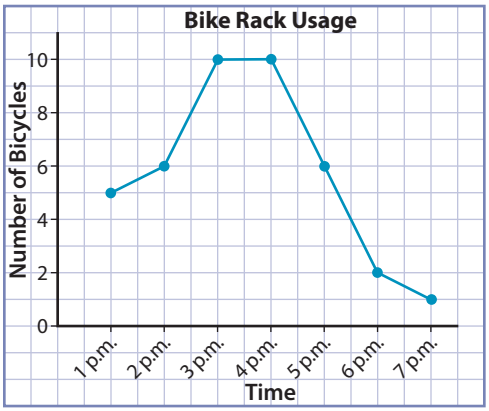
a) A line graph would be best because the data are continuous.

b) A bar graph would be best because it will show the number of units sold for each snack item.

c) A line graph would show Robert how his profits vary each day.

5. Examples:

a) A student is counting the number of bicycles in a bike rack at a park.



b) A bar graph could be used.

c) A line graph is best suited to this scenario because the data are continuous.

4.2 Interpolating and Extrapolating Values, pages 168 to 181

On the Job 1 Check Your Understanding, pages 174 to 175

1. Examples:

a) 10 kg **b)** 45 kg

c) 60 kg **d)** 65 kg

2. Examples:

a) 2 h **b)** 4.5 h

c) 6.5 h **d)** 80 km

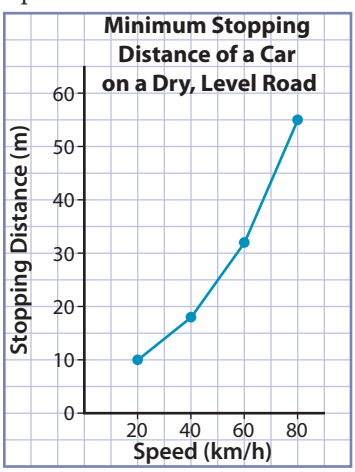
3. Examples:

a) 13 °C **b)** 4 °C

c) The difference in temperature between the top of her climb and sea level is 11 °C, so she might want to have a warmer jacket, but she should not need to dress for very cold weather.

4. Examples:

a)



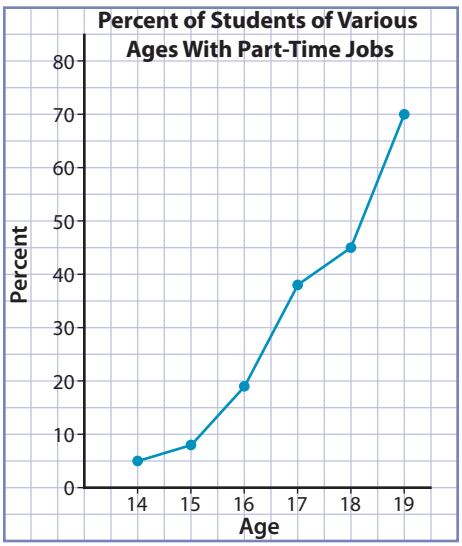
b) 10 km/h: 5 m; 70 km/h: 45 m
c) 110 km/h
d) reaction time of the driver, quality of brakes, mass of vehicle, quality of tires

On the Job 2 Check Your Understanding, pages 178 to 179

1. Examples:
a) Phillip's height has an upward trend. It increased less quickly between the ages of 4 and 8, and seems to have levelled after the age of 18.
b) Gina's height has an upward trend. It increased steadily until the age of 14, and seems to have levelled since then.
c) Because females tend to start puberty before males, Gina's growth was more steady, but she stopped growing at a younger age than Phillip did.

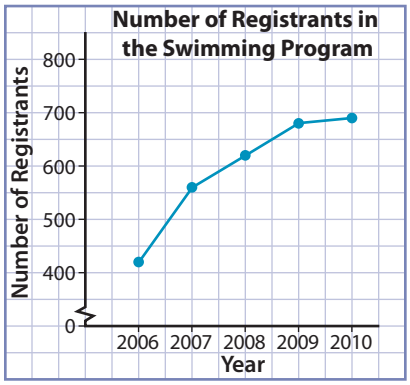
2. Examples:
a) The temperature dropped from 4:00 a.m. to 6:00 a.m. It then increased until 10:00 a.m., and then levelled until noon. Between noon and 2:00 p.m., the temperature again increased. After 2:00 p.m., it dropped until 4:00 p.m., and then levelled until 6:00 p.m. After 6:00 p.m., the temperature dropped steadily. This trend is typical for a January day when the sun is shining.
b) No, the trend would not be as clear in a bar graph; the plateaus between 10:00 a.m. and 12:00 p.m. and between 4:00 p.m. and 6:00 p.m. would not be as clear.

3. a) Example:



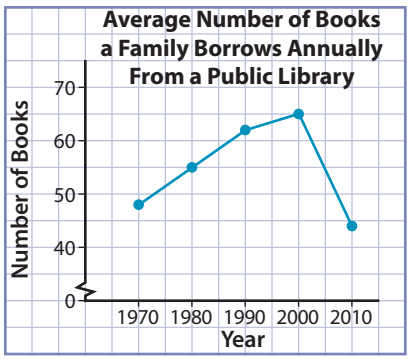
b) As the ages of the students increase, a higher percent of them have part-time jobs.
c) Example: A bar graph would show the same trend.

4. a) Example:



b) The trend is upward, but it seems to be levelling between 2009 and 2010.
c) Example: More funding might be recommended to help boost the levelling registration.

5. a) and **b)** Example:



Work With It, pages 180 to 181

1. Examples:
a) There is an upward trend; this trend cannot continue indefinitely because humans will have an upper limit to the height that they can jump.
b) 1.6 m
c) In 1952, 1968, 1992, and 2000 the winning heights did not follow the trend; the world high jump leaders may have suffered injuries prior to the Olympic Games.
d) 2.1 m

2. Examples:
a) There is a gradual increase in oil production each year.

b) No, this trend will not continue indefinitely due to a limited supply of oil, and due to increased popularity of renewable energy sources.

c) In 2007, about 430 000 m^3 of Canadian oil was produced daily.

d) 475 000 m^3

e) 350 000 m^3

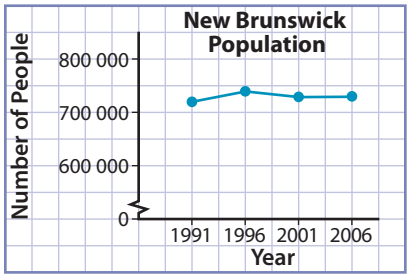
3. Examples:

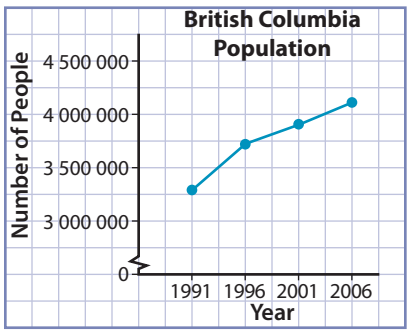
a) The trend starts as a gradual increase, but as time passes, the number of bacteria is increasing more quickly.

b) Leo's conclusion is more realistic than Marty's, given the rate at which the bacteria are multiplying.

c) Marty used a trend line straight across the entire graph, but the trend follows a curve on this graph. I would not recommend Marty's method for this graph.

4. a)





Example:
New Brunswick: 2011: 730 500 people, 2016: 731 000 people, 2026: 732 000 people; British Columbia: 2011: 4 400 000 people, 2016: 4 750 000 people, 2026: 5 250 000 people

b) New Brunswick: 755 500 people, British Columbia: 4 573 300; Example: The predictions may not be accurate due to economic conditions.

c) Example: The predictions may not be accurate due to economic conditions or environmental and sociological factors.

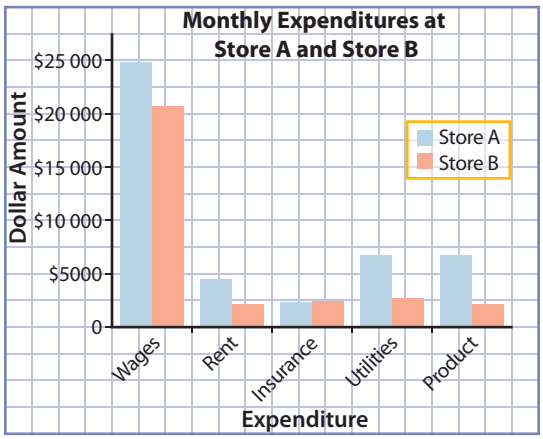
4.3 Graphic Representation, pages 182 to 195

On the Job 1 Check Your Understanding, pages 186 to 187

1. a) Example: Antonia's statement might not be true. The graphs only show the percent of the total expenditures that go toward each category; they do not show the dollar amount of each expenditure.

b) Store A: $24 750; Store B: $20 700

c) Yes. Example:



2. Examples:

a) More smart phones were sold than 3-D TVs, and more tablet PCs were sold than laptop PCs.

b) The bar graph best represents the data because the data are discrete, not continuous.

3. Examples:

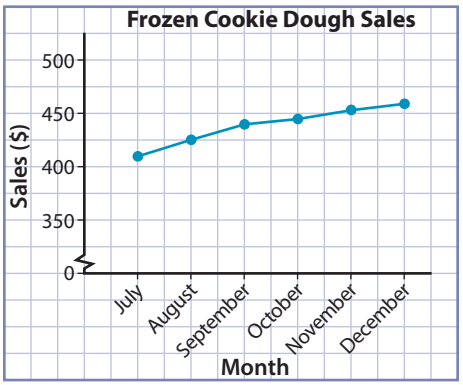
a) The number of grade 12 students who walk to school is the same as the number of grade 12 students who bike to school. Most of the grade 11 students walk to school.

b) Even though a higher percent of grade 11 students walk to school than grade 12 students, the actual number of students from each class who walk to school could be the same.

4. Examples:

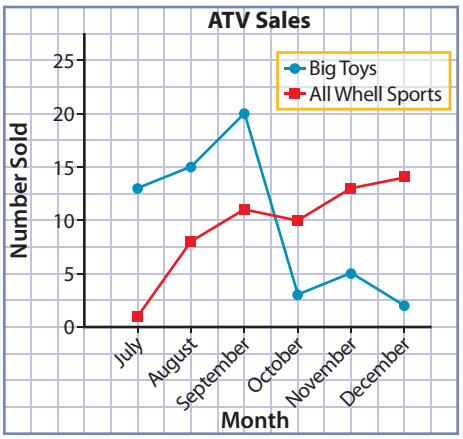
a) Her sales have increased from 410 units to 458 units, an increase of about 12%. The graph implies a dramatic increase, but the data show that the increase is not as dramatic as it may seem.

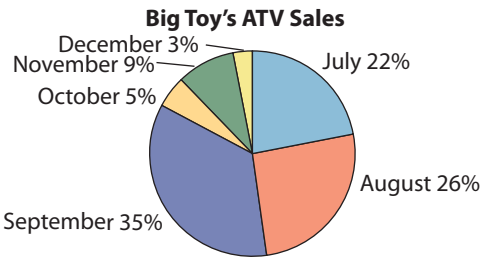
b)

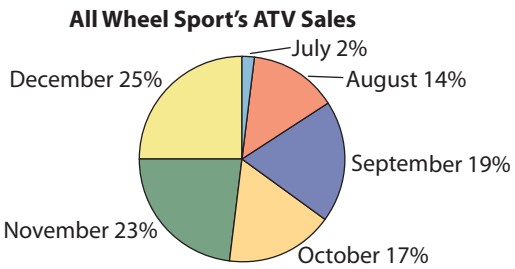


5. Examples:

a)







b)

Double Bar Graph	Big Toys appears to be selling a lot more ATVs than All Wheel Sports.
Double Line Graph	All Wheel Sports has been increasing the number of ATVs that they sell.
Two Circle Graphs	Big Toys had three good months, All Wheel Sports has slowly been increasing their sales.

c) Different graphical representations give the viewer different viewpoints for the same data.

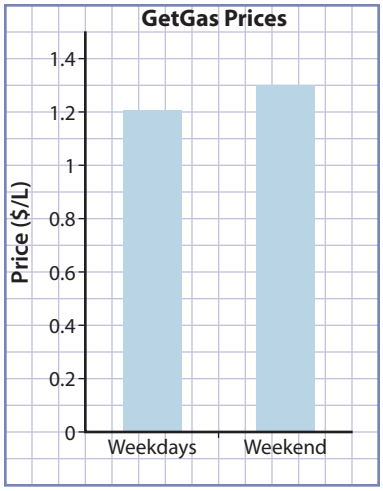
On the Job 2 Check Your Understanding, pages 190 to 193

1. Examples:

a) The range of values shown on the *y*-axis makes the weekend price look twice as high as the weekday price.

b) The gas price on weekends is about twice as much as the gas price on weekdays.

c)



2. Examples:

a) The axes labels, title, and data set are the same.

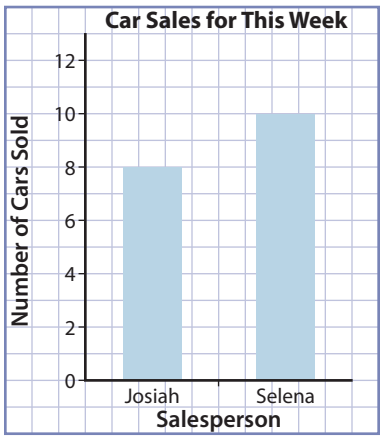
b) The *y*-axis values are different.

c) The tourist company in Calgary would use the second graph. The Eastern Canada company would use the first graph. The clothing company in Newfoundland would use the second graph.

3. a) Example: Josiah likely developed the graph because his bar is much wider than Selena's.

b) Selena

c) Example:



d) Selena should be Salesperson of the Week because she sold more cars.

4. a) Example: Health Care: 38%, Education: 25%, Energy: 22%, Infrastructure: 12%, Other: 3%

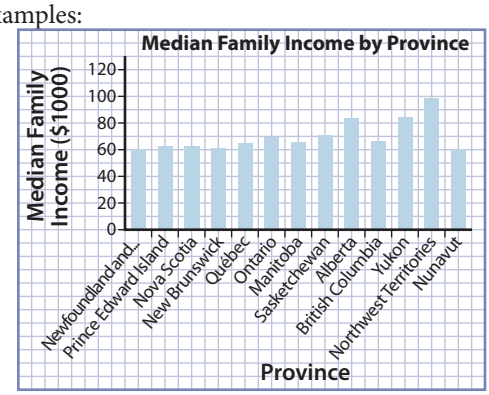
b) about 17%

c) Example: No, the actual percent is lower because the graph chosen makes the "Energy" wedge seem much larger than it actually is.

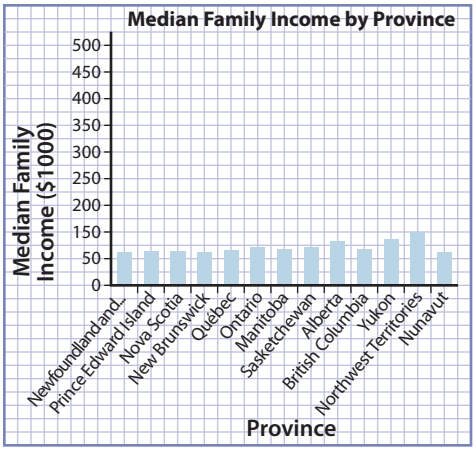
d) Example: Since the market research company told the party that people want more money budgeted for green energy research, the party would likely prefer to use the graph.

5. Examples:

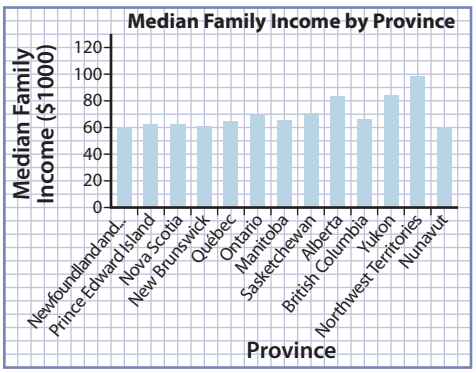
a)



b)



c)



6. Examples:

a) The graphs have the same titles, axes labels, and data values.

b) The *y*-axis values are different.

c) The first graph gives a more accurate representation; the second graph makes it appear that the 2012 revenue was four times as much as that in 2000.

7. a) Solar Energy Co.

b) about $2.25

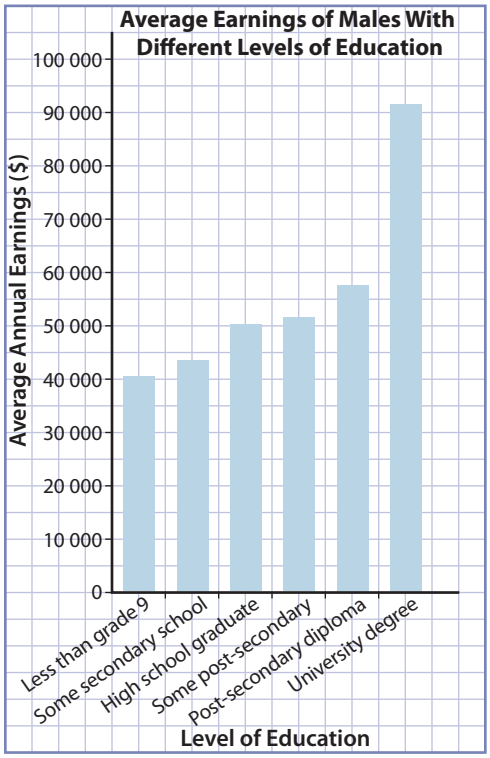
c) about $22.00

d) Yes. Harness the Sun Ltd.'s stock has increased more than ten times as much as Solar Energy Co.'s stock, but Solar Energy Co. appears to have increased more.

e) Timothy's graphs could mislead his clients.

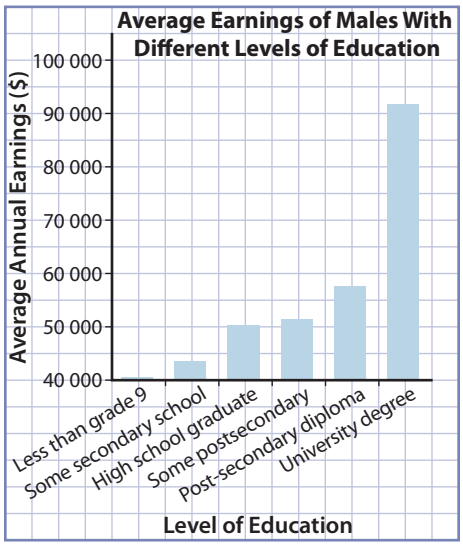
Work With It, pages 194 to 195

1. a)



b) Examples: Males with a university degree earn more than twice as much as males with less than a grade 9 education; males who graduate high school earn almost $10 000 more annually than males with less than a grade 9 education.

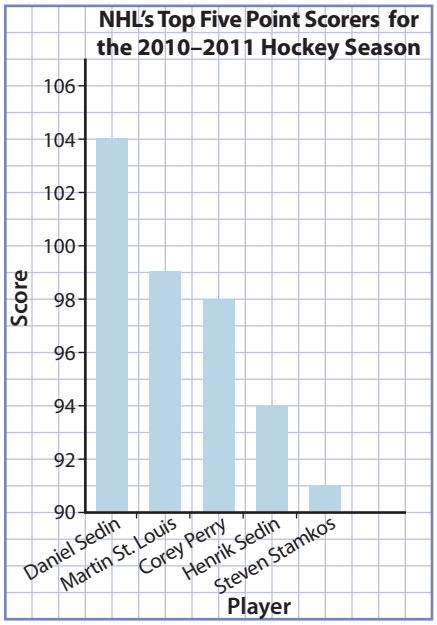
c)



d) Example: A university might use the second graph to try to show high school students that they can earn significantly more money by obtaining a university degree.

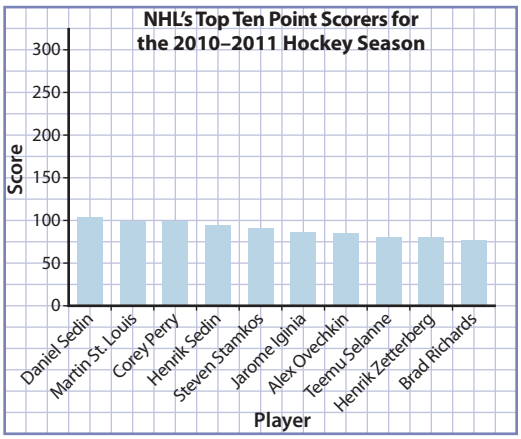
2. Examples:

a)



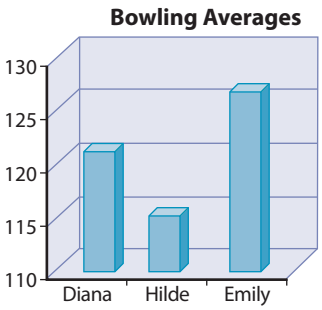
The graph makes it appear that Daniel Sedin has scored 3.5 times as much as Henrik Sedin.

b) Example:



The graph makes it appear that Martin St. Louis is scoring about the same number of points as Daniel Sedin.

3. Examples:



a) The purpose of the graph is to show how high Emily's bowling average is.

b) The graph makes it appear that Emily's bowling average is more than three times Hilde's bowling average.

c) A data set might be misrepresented to sway consumers' decisions.

d) The graph could be drawn with a y-axis scale that starts at zero.

4. Examples:

a) Inaccurate data could be that they sold $5000 of garden items each month from April to August.

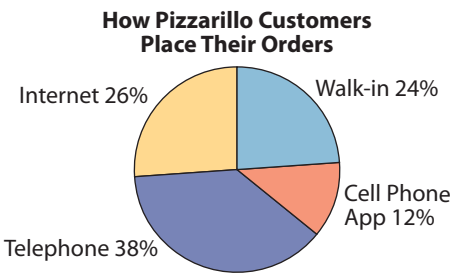
b) Misleading data could be a graph with a large range of y-axis values that minimize the fallen sales in July and August.

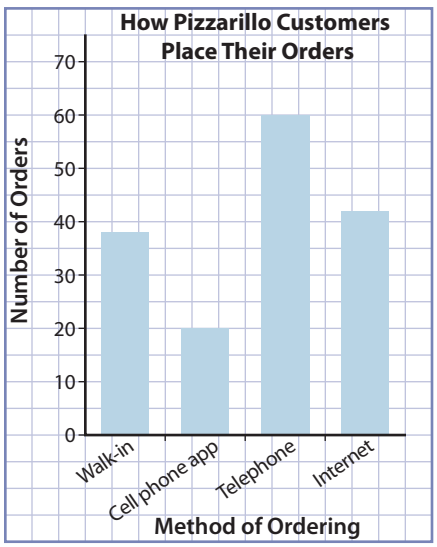
c) Misleading data can help to convince consumers to shop at the retailer's store.

Chapter 4 Skill Check, pages 196 to 197

1. Examples:

a)



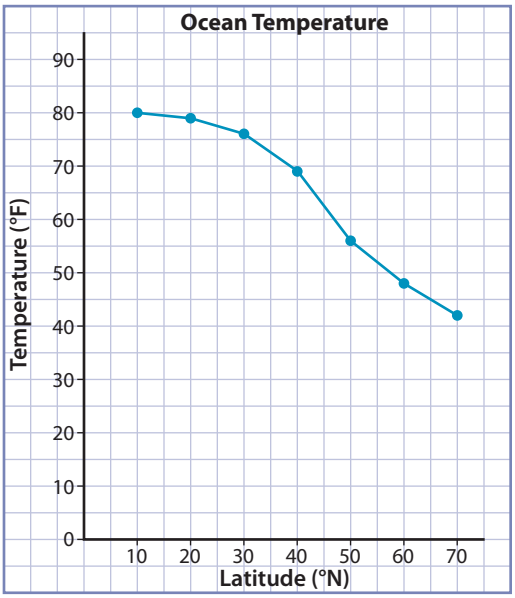


b) The circle graph is visually interesting, but it does not show the number of customers who use each method of ordering. The bar graph shows the number of customers using each type, but it is more difficult to compare the number of customers using each method of ordering.

c) A line graph would not be appropriate because the data are discrete, not continuous.

2. Examples:

a)



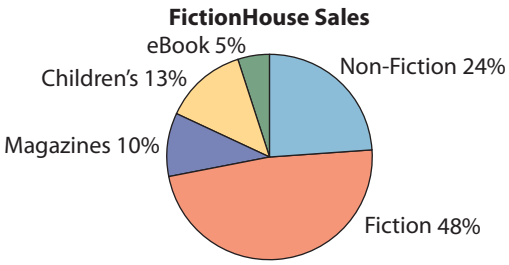
b) As the oceanographer moves farther away from the equator, the temperature drops.

c) about 59 °F

d) about 30 °F

3. a) Example: The graphs do not support the ad's statement. The graphs show the percent of each store's sales that are fiction books, but they do not show whether FictionHouse sells a higher number of fiction books than its competitor sells.

b) Example:

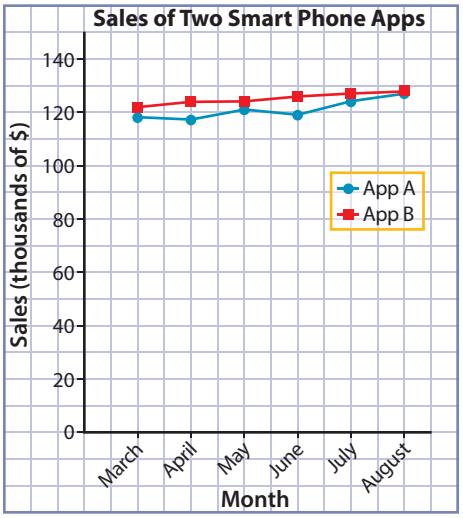


c) The total number of books sold by each store is required to know which store sold more fiction books.

Chapter 4 Test Yourself, pages 198 to 199

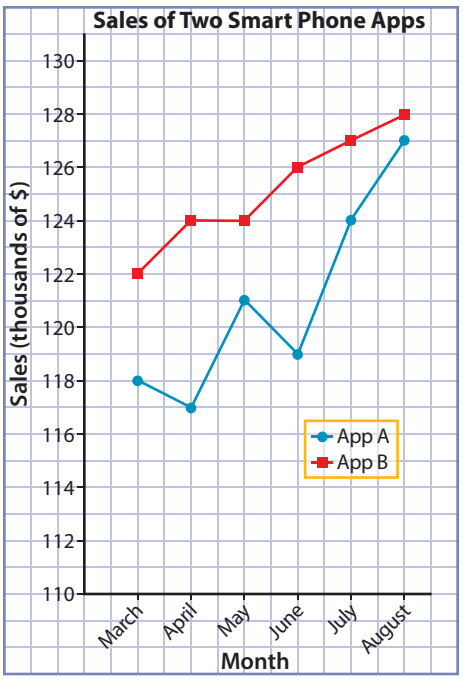
1. D
2. A
3. C
4. B
5. B
6. Examples:

a) a line graph;



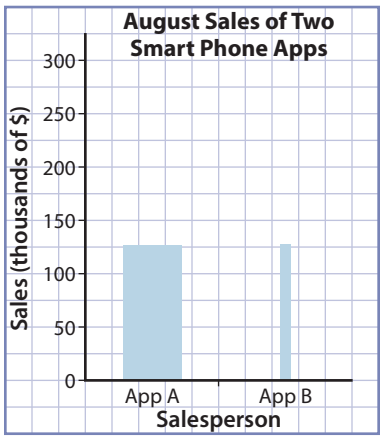
Both App A and App B seem to show an overall upward trend. The sales of App B over the six months are always greater than the sales of App A.

b) Example:



The graph makes it appear that App B's sales are significantly higher than App A's sales, due to the *y*-axis values.

c) Example:

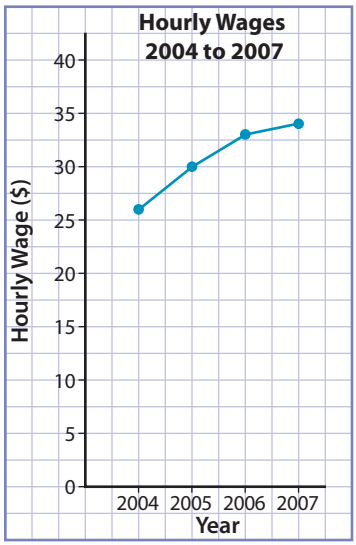


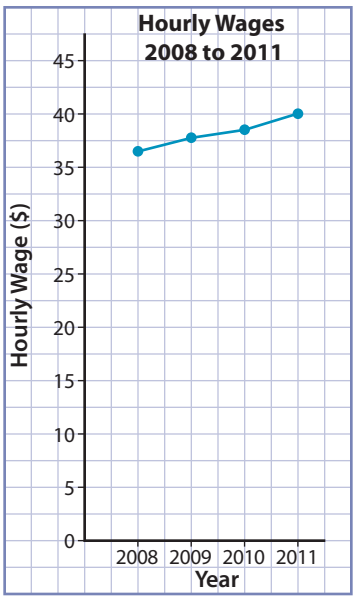
The graph makes it appear that App A's sales are significantly more than App B's sales, because the bar for App A is so much wider than the bar for App B.

7. Examples:

a) The first graph appears to show a slight increase in wages before the current union representative took over the position, while the second graph appears to show that the wages have increased significantly since 2008.

b) Change the scales on the vertical axis for each graph.





c) Before the new union representative took over, wages increased $8 in four years. Since the new union representative took over, wages have only increased $3.50 in four years.

8. Examples:

a) Domestic car sales peaked in 2008, but have been dropping since then. Imported car sales have been stable since 2008.

b) 2011: 8000; 2013: 7500

c) The trend might continue as imported cars become more affordable.

Chapter 5

Get Ready, pages 204 to 205

1. a) 2 years **b)** $\frac{1}{2}$ year

c) $\frac{1}{2}$ year **d)** $1\frac{1}{2}$ years

e) $\frac{1}{365}$ year **f)** $\frac{6}{73}$ year

g) Example: from 16 to 60 is 44 years

2. a) 48 months **b)** 60 months

c) 42 months **d)** 120 months

e) 240 months **f)** 300 months

g) Example: from 16 to 60 is 528 months

3. 1 and 72, 2 and 36, 3 and 24, 4 and 18, 6 and 12, 8 and 9

4. a) 1 **b)** 0.1 **c)** 0.01

d) 0.001 **e)** 0.299 **f)** 0.195

g) 0.0025 **h)** 0

5. a) $1 **b)** $3 **c)** $10

d) $50 **e)** $2 **f)** $4

g) $40 **h)** $180 **i)** $5

j) $70 **k)** $1400 **l)** $350 000

6. a) Example: $24 000

b) Examples: $3 \times 817430 =$ %; $3 \div 100 \times 817430 =$; $3 \times 817430 \div 100 =$

7. a) 1 **b)** 0.01 **c)** 0.008

8. a) 59 049

b) 0.000 001 073 741 824

c) 836.682 554…

9. Examples based on HST rate of 13%:

a) $0.26 **b)** $0.39 **c)** $0.52

d) $0.65 **e)** $1.30 **f)** $2.60

g) $13 **h)** $39 **i)** $130

j) $520

10. Example based on HST rate of 13%: $3900

11. Example based on HST rate of 13%: $3832.80

12. a) $12.10 **b)** $23.38

c) $38.80 **d)** $127.45

13. a) $12 **b)** $23

c) $39 **d)** $127

14. a) $d = \frac{C}{\pi}$ **b)** $w = \frac{A}{l}$

c) $d = V \times t$ **d)** $h = \frac{V}{lw}$

e) $b = \frac{2A}{h}$

5.1 Accounts, pages 206 to 213

On the Job 1 Check Your Understanding, pages 210 to 211

1. a) $6.25 **b)** $17.50

c) $5 **d)** $5

2. a) $0 **b)** $0

c) $0 **d)** $0

3. Examples:

a) I would prefer the account in #2 because there are no fees regardless of account activity.

b) online bank

4. Examples:

a) The PIN will be easy for him to remember.

b) No

c) His PIN will be easy for others to guess.

d) street address, last four digits of your phone number

5. a) 60

b) Example: personal chequing account

6. d) Example: People still should be careful when choosing a PIN, to make sure it cannot be guessed easily.

7. a) $4 **b)** 20%

8. a) $26.26 to each account

b) $170.11 **c)** $650

9. a) Example: Caitlyn has taken out more money than she had in her account.

b) $47.10

Work With It, pages 212 to 213

1. a) $16.21 **b)** $8.10

c) $24.31 **d)** $113.47

2. a) $117.30 **b)** $18.82

c) Example based on HST rate of 13%: $22.59

d) Example based on HST rate of 13%: −$3.77

e) Example: Mara can pay cash for the sweater, or she can decide not to purchase it.

f) Example: Mara could have used cash to pay the $18.48 in part b).

3. Example:

Term	Definition
Account	A place at a bank to hold your money
Interest	A fee paid for borrowing someone else's money
Service charges	Costs that a bank charges for providing services
Incentives	Bonus features or points offered by a bank
Bank statement	A record of the transactions in an account
Credit	Money added to a bank account
Debit	Money subtracted from a bank account
Balance	The amount of money in a bank account
ATM	Automated teller machine; a bank machine
PIN	Personal identification number; a secure number for accessing your bank account
Overdraft protection	A service in which a bank may cover transactions even if the account balance is $0

4. Examples: Secure Electronic Transaction (SET), encryption, digital certificates, VerifID

5. Example: No. Although "Pa55w0rd" uses both capital and lower-case letters and numbers, it is not a good password because it can be easily guessed.

6. a) Yes, Ryan's friend is right.

b) Example: If Ryan only needs $20, he should only withdraw $20.

c) Example: Ryan could go to his own bank to withdraw money from the ATM, where there is likely no fee.

7. Example: Zack could open a savings accounts and transfer money into the other accounts as soon as his paycheque is deposited; Zack could withdraw the amount of cash he is allowing himself to spend, and not carry his bank card with him.

8. Examples:

a) pay bills, transfer funds, make loan payments

b) Advantages: convenient, quick;
Disadvantages: easy to accidentally pay too much, possible computer security issues

5.2 Budgets, pages 214 to 227

On the Job 1 Check Your Understanding, pages 218 to 221

1. a) $17.72 **b)** $20.74

c) $8.95 **d)** $20.99

2. a) $35.44 **b)** $41.48

c) $17.90 **d)** $41.98

3. Examples:

a)

Date	Amount	Spent on …
April 1	$100.00	GIC
April 2	$2.75	Bus
April 2	$9.88	Pizza
April 2	$12.25	Movie
April 4	$59.32	Cell phone bill
April 6	$2.21	Snacks
April 8	$30.00	Savings account
April 10	$5.50	Bus
April 10	$72.83	Jacket
April 10	$8.67	Burger and fries
April 11	$3.92	Snacks
April 15	$2.75	Bus
April 15	$12.25	Movie
April 17	$2.47	Snacks
April 19	$5.50	Bus
April 21	$5.50	Bus
April 21	$12.25	Movie
April 22	$30.00	Savings account
April 23	$3.67	Snacks
April 24	$2.75	Bus
April 27	$5.50	Bus
April 27	$12.25	Movie
April 28	$8.25	Bus
April 29	$5.50	Bus
April 30	$7.59	Pizza

b) transportation: $44.00; savings: $60.00; investment: $100.00; entertainment: $87.41; phone expenses: $59.32; clothing: $72.83

c) savings: $60.00; investment: $100.00

d) Put more money into savings and investments.

e) No. I spend too much on entertainment.

f) See fewer movies and eat fewer meals out.

g) total income: $450; transportation: $45; savings: $120.00; investment: $150.00; entertainment: $50; phone expenses: $60; clothing: $25

h)

Date	Amount	Spent on ...
May 1	$150.00	GIC
May 3	$5.50	Bus
May 3	$12.25	Movie
May 4	$63.81	Cell phone bill
May 6	$60.00	Savings account
May 8	$16.23	Socks
May 10	$5.50	Bus
May 10	$11.28	Pizza
May 12	$1.61	Snacks
May 14	$8.25	Bus
May 17	$2.84	Snacks
May 18	$5.50	Bus
May 20	$60.00	Savings account
May 21	$12.25	Movie
May 21	$5.24	Snacks
May 23	$2.75	Bus
May 27	$5.50	Bus
May 27	$12.25	Movie
May 29	$5.50	Bus
May 30	$5.93	Burger

Transportation: $38.50; savings: $120.00; investment: $150.00; entertainment: $63.65; phone expenses: $63.81; clothing: $16.23

4. a) $480 **b)** $600

c) $120 each week

d) lunches: $87.00; clothes: $78.35; Mom: $80.00; going out: $97.00; phone: $44.30; miscellaneous: $67.04; saving: $26.31

e) $480

f) Ben spent more money than he earned that week.

g) Example: expenses that cannot easily be categorized. This category might contain the cost of a cab and the cost of a raffle ticket.

h) Example: Limit himself to $20 per week for going out, limit himself to $10 per week for miscellaneous expenses, and limit himself to $20 per week for lunches.

5. $69.23

6. Examples:

a) cell phone, dining out, clothing, gifts, salon, public transit, movies, music, vacation souvenirs, savings account, other investments

b) rent, utilities, Internet, cell phone, groceries, dining out, clothing, gifts, salon, car payments, fuel, insurance, repairs, car wash, parking, cable, movies, music, health insurance, prescriptions, over-the-counter drugs, life insurance, vacation travel, vacation accommodations, vacation food, vacation souvenirs, savings account, other investments

c) rent, Internet, property tax, car payments, health insurance

d) groceries, fuel, gifts, prescriptions, home decorating

e) rent, utilities, groceries, child care, prescriptions

f) vacations, charity, magazines, club memberships, sports equipment

7. a) saving for Florida trip, insurance on family car

b) $90

c) Examples: additional savings for Florida trip, saving for college, saving for a car

d) Example:

Monthly Budget (April)	
Estimated Income ($)	
Work	350
Babysitting	200
Total Income	**550**
Expenses ($)	
Saving for Florida trip	50
Cell phone	60
Clothes	100
Eating out	80
Personal products	25
Entertainment	100
Insurance on family car	45
Saving for college	90
Total Expenses	**550**

8. Examples:

Step 1:

a) rent, utilities, Internet, cell phone, groceries, dining out, clothing, gifts, salon, car payments, fuel, insurance, repairs, car wash, parking, cable, movies, music, health insurance, prescriptions, over-the-counter drugs, life insurance, vacation travel, vacation accommodations, vacation food, vacation souvenirs, savings account, other investments

b) rent: $800, utilities: $200, Internet: $50, cell phone: $50, groceries: $200, dining out: $75, clothing: $50, gifts: $40, salon: $30, car payments: $300, fuel: $200, insurance: $100, repairs: $60, car wash: $30, parking: $50, cable: $75, movies: $25, music: $30, health insurance: $110, prescriptions: $20, over-the-counter drugs: $20, life insurance: $140, vacation travel: $30, vacation accommodations: $100, vacation food: $100, vacation souvenirs: $10, savings account: $100, other investments: $200

Step 2:

Welders in Newfoundland average about $40 000 per year, gross pay.

Step 3:

Expenses total $3195 per month, which requires a take-home pay of $38 340 per year; Some money can be taken out of the vacation fund to balance the budget.

On the Job 2 Check Your Understanding, pages 224 to 225

1. a) Example: Their leftover money is put away for a "rainy day."

b) Car insurance is likely a fixed expense; gas and repairs for the car is likely a variable expense.

c) Example: saving to buy a house, rent, RRSPs, car insurance, phone/cable/Internet, saving for a vacation, gym

d) Example: $2265

e) Example: $1185

f) Example:

Monthly Budget (September)	
Income ($)	
Paul	1950
Sandra	1500
Total Income	**3450**
Fixed Expenses ($)	
Saving to buy a house	500
Rent	875
Investing (RRSPs)	200
Car (insurance)	250
Phone/cable/Internet	120
Saving for a vacation	200
Gym	120
Total Fixed Expenses	**2265**
Variable Expenses ($)	
Groceries	400
Car (gas, repairs)	250
Cell phone	30
Medical/personal items	100
Gifts and charity	100
Entertainment	200
Leftover money for a "rainy day"	105
Total Variable Expenses	**1185**
Total Expenses	**3450**
Income — Expenses	**0**

2. a) decreased by $200

b) Example: They reduced the amount that they are saving to buy a house.

c) renovate second bedroom and education fund for child

d) $250

e) none

f) saving to buy a house, saving for a vacation, entertainment, leftover money for a "rainy day"

g) saving to buy a house: $200, saving for a vacation: $100, entertainment: $100, leftover money for a "rainy day": $50

h) February

3. a) $1139

b) rent, bus pass, loan repayment

c) Example:

Monthly Budget	
Income ($)	
Wages	700
Tips	400
Total Income	**1100**
Expenses ($)	
Rent	325
Bus pass	72
Entertainment	100
Food	400
Health/personal	30
Loan repayment	212
Total Expenses	**1139**

d) −$39

e) Example: limit herself to $61 per month for entertainment

f) Example:

Monthly Budget	
Income ($)	
Wages	700
Tips	400
Total Income	**1100**
Expenses ($)	
Rent	325
Bus pass	72
Entertainment	61
Food	400
Health/personal	30
Loan repayment	212
Total Expenses	**1100**

4. Examples:

a) Example: No. All of Janet's expenses will stay the same whether there are four or five Fridays in a month.

b) Example:

Monthly Budget	
Income ($)	
Wages	875
Tips	500
Total Income	**1375**
Expenses ($)	
Rent	325
Bus pass	72
Entertainment	76
Food	400
Health/personal	30
Loan repayment	472
Total Expenses	**1375**

5. Example:

Monthly Budget	
Income ($)	
Wages	700
Tips	400
Total Income	**1100**
Expenses ($)	
Rent	325
Bus pass	72
Entertainment	100
Food	400
Health/personal	30
Savings account	73
Saving for a vacation	100
Total Expenses	**1100**

Work With It, pages 226 to 227

1. a) Example: Bailey identifies her fixed expenses with calculations or the dates that they are due.

b) $1119

c) $931

d) Examples: rent, Internet, groceries

e) $181; Example: She could put additional money into a savings account.

f) $3075

g) Example: eliminate spending money, vacation savings, and her clothing allowance

2. Example:

Term	Definition
Budget	An organized plan for income and spending
Balanced budget	A budget in which the total income equals the total expenses
Income	Money earned during a specific period
Expense	Money paid out during a specific period
Gross pay	Amount of money earned before deductions
Net pay	Amount of money earned after deductions
Fixed expenses	Expenses that do not change month to month
Variable expenses	Expenses that can change month to month
Essential expenses	Expenses required for normal life
Non-essential expenses	Expenses that are not necessary

3. a) January: $1285, February: $793.63, March: $866.70, April: $776.59

b) rent: $2950, phone: $90, utilities: $681.92

c) Example: entertainment, groceries, transportation

d) Example: Mario's gas bill should decrease because the temperature will be higher, so less heat will be needed.

4. Example: If the allowance is a predictable amount, and if it is paid on a predictable day, then yes, this money is income for budgeting purposes.

5. Example: Zack can create a balanced budget that includes a category for savings.

5.3 Simple and Compound Interest, pages 228 to 238

On the Job 1 Check Your Understanding, pages 232 to 233

1. a) \$15 **b)** \$30
c) \$45 **d)** \$150

2. a) \$60 **b)** \$30
c) \$15 **d)** \$5

3. a) \$20 **b)** \$30
c) \$70 **d)** \$5

4. a) $P = \frac{I}{r \times t}$ **b)** $r = \frac{I}{P \times t}$
c) $t = \frac{I}{P \times r}$

5. a) \$10
b) \$20
c) 50 years
d) Example: Rich could buy GICs with all of his birthday money until he has enough for the motorcycle.

6. a) 1 year: \$44.25; 2 years: \$93.00; 3 years: \$141.75; 4 years: \$198.00
b) 1 year: \$1544.25; 2 years: \$1593.00; 3 years: \$1641.75; 4 years: \$1698.00

7. a) \$41.25 **b)** $\frac{5}{12}$ year **c)** \$17.19

8. a) \$1000 **b)** 3% **c)** 10 years

9. Examples:
a) How much money will earn \$50 interest in 2 years, invested at 2.5%?; What interest rate will allow \$5000 to earn \$2000 interest in 5 years?; How long will it take a \$200 investment to earn \$20 interest at an interest rate of 2%?
b) \$1000; 8%; 5 years

On the Job 2 Check Your Understanding, pages 236 to 237

1. a) \$1040.40 **b)** \$1040 **c)** \$0.40

2. a) \$4243.60 **b)** \$4240 **c)** \$3.60

3. \$543.18

4. \$1204.99

5. a) \$1200 **b)** \$1376.45

6. \$3.43

Work With It, pages 237 to 238

1. a) \$250 **b)** \$2500
c) 1% **d)** 20 years

2. a) \$11 576.25 **b)** \$10 816.00
c) \$10 200.00

3. Example:

Term	Definition
Guaranteed Investment Certificate (GIC)	A low-risk investment guaranteed by the bank; interest rates are higher than a bank account, but lower than other investments
Term deposit	An amount of money deposited for a fixed amount of time, sometimes with penalties for early withdrawal
Simple interest	Interest that is paid once, usually at the end of the time period of the investment
Future value	The value of an investment at the end of a time period
Present value	The amount of money invested
Compound interest	An investment that earns you interest on your interest after each compounding period
Canada Savings Bond	An investment that earns simple interest, paid at the end of the term or when the owner cashes it in
Fixed term investments	Money that must be invested for a specific period of time

4. a) Example: Option 1
b) Example: For one year, simple interest and interest compounded annually are the same. Since Option 1 has the higher interest rate, it pays more.
c) Option 1: \$1226.40; Option 2: \$1225.20
d) Yes

5. Example: The longer an investment earns compound interest, the greater the future value of the investment when compared to the same period earning simple interest.

6. Example: The greater the interest rate, the greater the future value.

7. Example: I disagree because over time, significant money can be earned through investments earning compound interest.

5.4 Investing and Borrowing, pages 239 to 251

On the Job 1 Check Your Understanding, pages 243 to 245

1. a) 1 **b)** 2
c) 3 **d)** 5

2. a) 2 **b)** 4
c) 6 **d)** 14

3. a) 12 **b)** 24
c) 36 **d)** 120

4. **a)** 1.5% **b)** 0.75%
c) 0.25% **d)** about 0.008 219%
5. **a)** 0.015 **b)** 0.0075
c) 0.0025 **d)** 0.000 082 19
6. **a)** 2 **b)** 0.03 **c)** $4243.60
d) value after the first compounding period: $4120; value after the second compounding period: $4243.60
e) The answers are the same.
7. **a)** $n = 4$, $i = 0.02$ **b)** $10 824.32
c) value after the first compounding period: $10 200; value after the second compounding period: $10 404; value after the third compounding period: $10 612.08; value after the fourth compounding period: $10 824.32
d) The answers are the same.
8. **a)** $2368.55 **b)** $1044.09 **c)** $4208.59
d) Example: No. The value after 60 years will be much more than double the value after 30 years.
e) $17 712.23
f) The original investment has grown by more than 17 times.
9. All of the answers should be the same.
10. **a)** 9.2% **b)** $5460 **c)** $6510.85
d) Example: No. Mutual funds are volatile, and their values can increase or decrease quickly and significantly.
e) Examples: increase 1%, decrease 3%, decrease 6%
11. **Step 1:**
a) $2032.79 **b)** $2039.89
c) $2025.82 **d)** $1992.56
Step 2:
a) Example: The investment approximately doubles in each scenario.
b) Example: The number of compounding periods multiplied by the interest rate (as a percent) per compounding period equals 72.
Step 3:
a) Example: 12 years
b) $1000(1.06)^{12} = \$2012.20$
12. **a)** $6000 **b)** $12 000 **c)** $60 000
d) Example: Their initial investment of $2000 earns them 3 times that amount each year.

On the Job 2 Check Your Understanding, pages 247 to 249

1. **a)** $5640.48 **b)** $640.48
2. **a)** $5427.36 **b)** $427.36
c) $213.12
3. **a)** 0.0545% **b)** 0.0490%
c) 0.0436% **d)** 0.06%
4. Example: When consumers read the interest rate, they read left to right. They see the "1" at the beginning instead of a "2," so the consumers know that they are paying less than 20%.
5. $1545.63
6. **a)** $99.24 **b)** $10
c) August 16
d) Example: Noelle's parents might feel comfortable with having to pay $250 if Noelle cannot pay her balance.
e) 0.0463%; 0.000 46
f) $0
7. Examples:
a) 8
b) Yes. Annual fees range from $14.95 to $49.
c) 14.5% to 27.5%
8. Examples:
a) 12
b) Yes. Annual fees range from $10 to $30.
c) 19.9% to 24.9%
9. Examples:
a) 1 **b)** No **c)** 29.9%
10. Examples:
a) No, Braden should not use this outlet because the company is charging a 21% fee to advance the money for just 2 weeks. The fee is equal to an annual interest rate of 546%.
b) borrow from a friend until payday; ask his boss for an advance on his pay that can then be deducted from his paycheque
11. **a)** 0.000 22 **b)** $6.88
c) Example: Advantage: If she needs more time to pay back the $1200, she can just pay the $6.88 at the end of November, and then pay $1206.88 at the end of December; Disadvantage: Since there is no pressure on her to pay back the loan, she could just pay the interest each month and put off paying back the loan.

Work With It, pages 250 to 251

1. **a)** 8 **b)** 0.015 **c)** $9011.94
2. **a)** $4000 **b)** $3947.65
3. **a)** Example: He will pay less than $2000 interest over the five years.
b) 60 payments **c)** $24 735.60
d) $1735.60 **e)** $14 642.28
f) Example: No. His old truck should be worth $14 616.18.

g) Example: He could try to negotiate a higher trade-in for his old truck, or he could try to negotiate a lower interest rate for the new truck.

4. Example:

Term	Definition
Mutual fund	A collection of stocks and/or bonds that allows investors to pool their resources
Return	The profit on an investment
Personal loan	A loan for personal use
Line of credit	An arrangement between a bank and a client in which the client can borrow up to a maximum amount, and can repay it any time

5. a) $0 **b)** $0 **c)** $0
d) The tenant's rent paid for the minivan.

6. Examples:
a) Both a line of credit and a personal loan allow someone to borrow money from the bank; both need to be repaid.
b) A personal loan is for a set amount, whereas someone with a line of credit can borrow any amount up to a maximum. A personal loan has a set payment schedule, whereas a line of credit can be paid back at any time.
c) A personal loan might be preferred because the payment is a set amount every month. A line of credit might be preferred because it can be paid back in larger or smaller amounts.

7. Example: I disagree because if she is negotiating interest rates and the number of compounding periods, she must be able to assess what is a better deal for her.

8. Example: Credit cards help people build credit history, they allow people to shop online, and they allow consumers to buy products even though they might not receive a paycheque for another week.

9. Example: An investment compounded monthly is earning interest on each month's interest, whereas an investment compounded semi-annually is earning interest only on each 6-month's interest.

10. Examples:
a) a bank machine, because it is available for use any time of the day
b) speaking to a loans officer in person, because you may be able to negotiate interest rate and terms of the loan
c) Internet or phone banking, because it is immediate and convenient

11. Examples:
a) cash back or reward points, because they can be used for products
b) travel points, because there are often restrictive terms for using points to travel

Chapter 5 Skill Check, pages 252 to 253

1. a) $9.50 **b)** $5
c) $20 **d)** $5

2. $108.33

3. a) Example: rent, Internet, car lease, car insurance, gym, loan, golf membership, loan
b) $2400
c) Example: Reduce his spending money.

4. $60; $460

5. $551.25

6. $551.25

7. a) 60 payments
b) $53 358.60
c) $20 643.84

Chapter 5 Test Yourself, pages 254 to 255

1. A

2. C

3. D

4. B

5. C

6. B

7. a) $i = 0.015$, $n = 8$
b) $i = 0.0025$, $n = 12$

8. a) $2252.99 **b)** $515.21

9. a) $602.70 **b)** $575
c) Example: She could put additional savings towards college.
d) No. Example: Stephanie will need to save an additional $66.67 per month to meet her goal. The money could come from her clothing expense.

10. a) $3890.52 **b)** $390.52

11. a) $10 200 **b)** $30 600

Chapter 6

Get Ready, pages 260 to 261

1. a) $\frac{1}{3}$ **b)** $\frac{1}{2}$
c) 0 **d)** $\frac{1}{4}$

2. a) $x = 50$ **b)** $x = 5$
c) $x = 12$ **d)** $x = 20$

3. a) 4 **b)** 18
c) 25 **d)** 5

4. a) 12 in. **b)** 72 in.
c) 53 in. **d)** 30 in.

5. a) 100 cm **b)** 400 cm
c) 810 cm **d)** 50 cm

6. a) 24% **b)** 4%
c) 125% **d)** 10%

7. a) 0.65 **b)** 0.44
c) 0.2 **d)** 0.01

8. a) 61% **b)** 4%
c) 125% **d)** 130%
e) 56% **f)** 12%

9. a) $\tan A = \frac{5}{7}$ **b)** $\tan A = \frac{8}{5}$
c) $\tan A = \frac{12}{7}$

10. a) 0.29 **b)** 3.08
c) 11.43

11. a) 32° **b)** 14°
c) 54° **d)** 70°

12. a) 14° **b)** 18°
c) 21°

13. a) 16 in. **b)** 18 cm
c) 20 cm **d)** 7 in.

6.1 What is Slope?, pages 262 to 273

On the Job 1 Check Your Understanding, pages 266 to 267

1. line A: rise = 2, run = 1; line B: rise = 1, run = 2

2. AB: $\frac{3}{2}$; CD: 2

3. a) $\frac{1}{2}$
b) Example: Yes. The rise and run are the same for EF as they are for DE.
c) Example: Yes. The ratio of rise to run is the same for line segments DE and AF.
d) Examples: AB, BC, BF, CE

4. $\frac{1}{2}$

5. 4 cm

6. No, the line is not straight. The slope from (0, 0) to (2, 2) is 1, but the slope from (2, 2) to (5, 6) is 4:3.

7. Carolyn is correct; the rise of the roof is 4′, and the run on each side of the roof is 12′.

8. $\frac{1}{4}$

9. a) Skier's Surprise: 0.33; Rigorous Run: 0.53; Magic Mountain: 0.41; Bunny Slope Express: 0.32
b) Example: Kara might prefer Rigorous Run because it has the greatest slope.
c) Example: Amy might prefer the Bunny Slope Express because it has the least slope, and because it is the shortest run.

On the Job 2 Check Your Understanding, pages 270 to 271

1. a) $x = 31$ **b)** $x = 224$
c) $x = 10$ **d)** $x = 100$

2.

	Rise	Run	Slope
a)	60 m	10 m	6
b)	15 in.	50 in.	$\frac{3}{10}$
c)	75 cm	100 cm	$\frac{3}{4}$
d)	1 inch	1 foot	$\frac{1}{12}$
e)	4 inches	$2\frac{1}{2}$ feet	$\frac{2}{15}$
f)	3 m	400 cm	$\frac{3}{4}$
g)	50 cm	2 m	$\frac{1}{4}$

3. $\frac{1}{9}$

4. a) $\frac{1}{3}$ **b)** 12 ft

5. a) $\frac{12}{13}$ **b)** about 0.1538
c) about 15%

6. a) $\frac{9}{11}$
b) $\frac{9}{11}$; The slope is constant, so the slope of each step is the same as the slope of the entire staircase.

7. The yellow ramp has the greater slope.

8. about 0.576

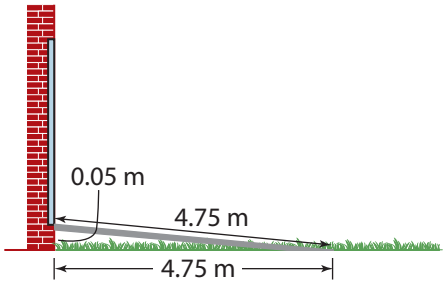
9. a) 6 in. **b)** 24 ft
c) 1

Work With It, pages 272 to 273

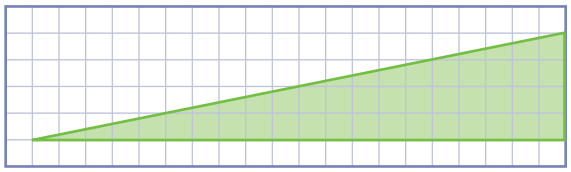
1. a) rise: $4\frac{1}{4}$ ft; run: 10 ft

b) $\frac{5.1}{12}$

2.



3. a)



b) Example: Check that the hill rises 1 square for every 5 horizontal squares.

4. a) Susan is incorrect. If the length of the ladder is known, and the distance between the base of the ladder and the base of the wall is known, the vertical height to the point where the ladder touches the wall can be determined using the Pythagorean relationship.

b) Debbie is incorrect. If the run is $1\frac{1}{4}$ ft, the rise must be no more than 5 ft for the ladder to be safe.

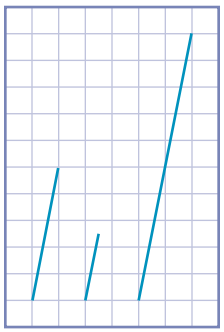
5. Example: Measure the rise and run between any two points on the line. If the ratio of rise : run is the same between the two points as the ratio of rise : run between the ends of the line, the slope is constant.

6. Evan is correct. Heavenly Hill has a slope of 0.375; Haggard Hill has a slope of 0.25.

7. a) The line rises 5 units for every 1 horizontal unit.

b) Examples: rise: 5 cm, run: 1 cm; rise: 10 m, run: 2 m; rise: 1 m, run: 20 cm

c) Examples:



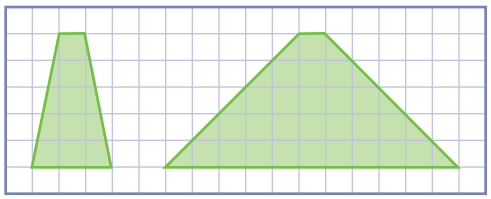
The lines are congruent.

8. a) Examples: Gabrielle may see positive slope when she is going up hills, negative slope when she is going down hills, and zero slope when she is walking along flat surfaces.

b) Gabrielle will use the most energy climbing tall hills with a greater slope.

c) She will use the least energy when she is walking on the flat surfaces.

9. Example:



The first hill rises 5 squares and has a slope of 5. The second hill also rises 5 squares, but it has a slope of 1.

6.2 Relationship Between Slope and Angle of Elevation, pages 274 to 285

On the Job 1 Check Your Understanding, pages 278 to 279

1. a) $\frac{17}{8}$ **b)** $\frac{9}{25}$ **c)** $\frac{59}{68}$

2. a) 65° **b)** 20° **c)** 41°

3. a) 45° **b)** 53° **c)** 90°
d) 27° **e)** 68° **f)** 0°

4. 7°

5. a) 37.6 m

b) No. The slope of this ramp is about 0.21, but the slope of a wheelchair ramp should be no more than 0.125.

6. a) 810 cm **b)** 6°

7. a) isosceles; the points A and C are each 3 squares horizontally from point B.

b) AB: 2, BC: −2, AC: 0

c) Example: The slopes have equal magnitude but opposite signs.

d) 63°

e) ∠C will have the same measure as ∠A, because tan A = tan C.

On the Job 2 Check Your Understanding, pages 282 to 283

1. a) $\frac{35}{2}$ **b)** undefined

c) 0 **d)** $\frac{1}{12}$

2. a) the line in part c)

b) the line in part b) because it would be a vertical road

3. a) Example: The road drops 12 m vertically for every 100 m travelled horizontally.

b) $\frac{3}{25}$

4.

Road Name	Rise	Run	Slope as a Fraction	Slope as a Decimal	Percent Grade
Rarely Driven Route	1500	5000	$\frac{3}{10}$	0.3	30%
Snail Pace Strip	9	42	$\frac{3}{14}$	0.21	21%
Pothole Path	1	20	$\frac{1}{20}$	0.05	5%
Maniac Motorway	17	90	$\frac{17}{90}$	0.19	19%
Hurry-Up Highway	3	50	$\frac{3}{50}$	0.06	6%
Traffic Jam Thoroughfare	1	100	$\frac{1}{100}$	0.01	1%
Reckless Ramp	1	2	$\frac{1}{2}$	0.5	50%
Boggy Boulevard	1	16	$\frac{1}{16}$	0.0625	6.25%

5. a) 9° **b)** 1°

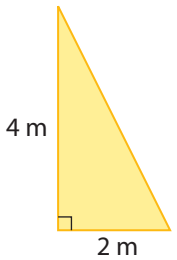
c) 3° **d)** 11°

6. Rarely Driven Route, Snail Pace Strip, Maniac Motorway, Hurry-Up Highway, Reckless Ramp, and Boggy Boulevard

7. 10%

8. 8%

9. a)



b) 76°

c) Yes, the ladder is safe because the slope is only 2.

Work With It, pages 284 to 285

1. a) 4.3 m **b)** 4.7 m

2. 48.6 m

3. a) 60″ or 5′ **b)** about 6°

4. 89 432 ft

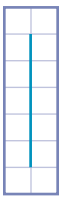
5. Examples: zero slope: table top, horizon, counter top; undefined slope: table leg, side of house, hinged edge of door

6. Yes. The slope of Chad's set of stairs is 0.8, and the guideline slope is 0.8.

7. A perfectly flat road has a 0% grade. Examples: This road will require more gas than a downward slope, but less gas than an upward slope.

8. a) The slope of a line is calculated as $\frac{\text{rise}}{\text{run}}$. In a horizontal line, the rise is always zero. Any fraction with zero in the numerator equals zero, so the slope of a horizontal line is zero.

b) The slope of a line is calculated as $\frac{\text{rise}}{\text{run}}$. In a vertical line, the run is always zero. Any fraction with zero in the denominator is undefined, so the slope of a vertical line is undefined.



9. Example: The slopes have the same magnitude, but opposite signs. This is important because the triangle is symmetrical.

10. a) Example: The road drops 1 m vertically for every 10 m travelled horizontally.

b) Example: In a higher gear, drivers will gain speed too quickly.

11. a) Example: When Andrea sees the slope is 2, she will likely realize that the slope is too steep for the line on the graph.

b) $\text{slope} = \frac{\text{rise}}{\text{run}}$

$= \frac{(5 - 4)}{(2 - 0)}$

$= \frac{1}{2}$

$\tan(\text{angle of elevation}) = \text{slope}$

$\tan(\text{angle of elevation}) = \frac{1}{2}$

$\tan^{-1}\left(\frac{1}{2}\right) = \text{angle of elevation}$

$26.565\ldots = \text{angle of elevation}$

The angle of elevation is about 27°.

6.3 Slope as Rate of Change, pages 286 to 297

On the Job 1 Check Your Understanding, pages 290 to 291

1. a) AB: rise 5, run 2; CD: rise 1, run 2; EF: rise −4, run 0; GH: rise 5, run 5; IJ: rise 0, run 4

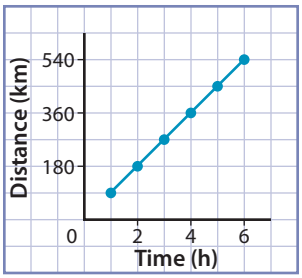
b) AB: 2.5; CD: 0.5; EF: undefined; GH: 1; IJ: 0

2. a) 2.5 **b)** undefined

c) 1 **d)** 0.125

3. a) 1 **b)** 2 **c)** 2

4. a)



b) 90

c) The slope is equal to the rate of change in distance.

5. $\frac{10}{9}$

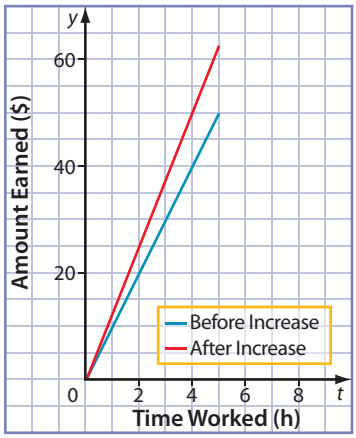
6. a)

Time Worked (h)	Amount Earned ($)	Rate of Change
0	0	
1	10	10 − 0 = 10
2	20	20 − 10 = 10
3	30	30 − 20 = 10
4	40	40 − 30 = 10
5	50	50 − 40 = 10

b) The rate of change is 10. This means that for each additional hour that Julie works, she is paid an additional $10.

c) 12.5

d)



Examples: The graphs both start at the point (0, 0), they both have a positive slope, and they are both only valid for positive numbers.

e) Example: The graphs have different slopes.

On the Job 2 Check Your Understanding, pages 294 to 295

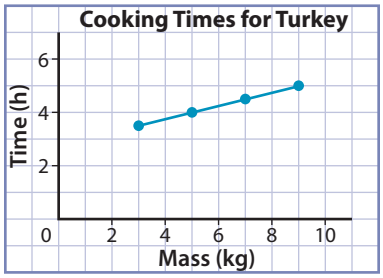
1. $\frac{3}{2}$

2. Table A shows a constant slope of 2. Table B does not show a constant slope; the *y*-values change by different amounts.

3. The rate of change in distance is 200. This means that for each hour that Toshi drove, he travelled an additional 100 km.

4. The rate of change in pay is 8. This means that for each hour that Olivia babysits, she earns an additional $8.

5. a)



b) The slope of the line is $\frac{1}{4}$. This means that for each additional kilogram in mass of a turkey, an additional $\frac{1}{4}$ of an hour is required to cook it.

6. a) There are five intervals that have constant slope. Label them as A: 0–0.5 h, B: 0.5–1.5 h, C: 1.5–2.5 h, D: 2.5–3.5 h, and E: 3.5–4.5 h in order from the origin.

b) A: 16; B: 8; C: 4; D: 6; E: 0

c) Each slope represents the miles travelled per hour during that interval, or speed.

d) In interval E, Chelsea's distance did not change, so she had stopped running.

e) 0

7. a) A: $\frac{3}{2}$; B: $\frac{2}{3}$

b) Example: The slopes are both positive. The slope of interval A has a rise of 3 and a run of 2, while the slope of interval B has a rise of 2 and a run of 3.

c) The temperature increases 3 degrees for each 2-hour interval that passes.

d) The temperature increases 2 degrees for each 3-hour interval that passes.

Work With It, pages 296 to 297

1. a) Jim is running faster during some intervals than during others.

b) Label intervals from A to E, starting at the origin. A: 80; B: 200; C: $66\frac{2}{3}$; D: 0; E: −400

c) Jim has stopped running.

2. a)

Number of Tables	Number of People
1	4
2	6
3	8
4	10
5	12

b) Two additional people are seated for each additional table.

c) 2

d) For each additional table, two more people are seated.

3. a) Between points A and B, the rate of change in height is $\frac{3}{2}$; this means that the height increases 3 m for each 2 m travelled in distance. Between points B and C, the rate of change in height is 0; this means that the roller coaster is travelling along a flat section. Between points C and D, the rate of change in height is $-\frac{3}{4}$; this means that the roller coaster is descending 3 m vertically for every 4 m of distance travelled. Between points D and E, the rate of change in height is 0; this means that the roller coaster is travelling along a flat section.

b) The steepest part is the ascent between points A and B.

4. Example: The rate of change is the change in the y-values divided by the change in the x-values. If Joe is paid \$15 per hour to cut grass, the rate of change is 15.

5. a) For each 12 horizontal units, the height of the roof increases by 5 vertical units.

b) A roof with pitch $\frac{12}{5}$ rises by 12 vertical units for each 5 horizontal units; a roof with pitch $\frac{12}{5}$ is much steeper than a roof with pitch $\frac{5}{12}$.

Chapter 6 Skill Check, pages 298 to 299

1. AB: $\frac{1}{4}$, CD: −1, EF: 3

2.

	Rise	Run	Slope
a)	0	6 m	0
b)	2 in.	3 in.	$\frac{2}{3}$
c)	2 m	200 cm	1
d)	4 m	0	undefined
e)	60 cm	3 m	$\frac{1}{5}$

3. a) 34° **b)** 79° **c)** 14°

4. 27°

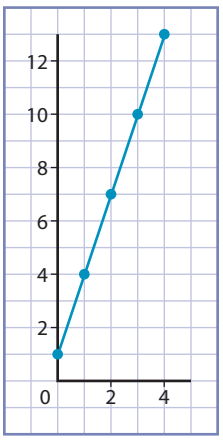
5. a) 0° **b)** 3° **c)** 10°

6. a) Example: The upper roof is steeper than the lower roof.

b) The upper roof will be more difficult to walk on because it is steeper.

c) The upper roof has a pitch of $\frac{12}{6}$ and the lower roof has a pitch of $\frac{6}{12}$, because the steeper roof has a greater pitch.

7. a)



b) The slope of the line is 3. This slope represents the change in the y-value for each incremental change in the x-value.

Chapter 6 Test Yourself, pages 300 to 301

1. A

2. B

3. A

4. a) A: $\frac{1}{2}$, B: 0, C: $\frac{3}{2}$, D: 0

b) A: rise of 1 for a run of 2; B: rise of 0 for any run; C: rise of 3 for a run of 2; D: rise of 0 for any run

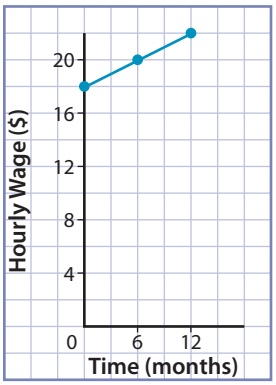
5. 15 ft

6. a) No, the slide's slope is $\frac{2}{3}$.

b) 347 cm

7. a) 3° **b)** Yes

8. a)



Yes, the graph shows a constant rate of change. The slope is constant.

b) $\frac{1}{3}$

c) For each three-month interval, Maura's wage is increased by $1.

Chapter 7

Get Ready, pages 306 to 307

1. a) 4 **b)** 9
c) 25 **d)** 100

2. a) estimate: 25; actual: 26.01
b) estimate: 49; actual: 47.61
c) estimate: 5; actual: 4.9729
d) estimate: 100; actual: 100.4004
e) estimate: 3600; actual: 3844
f) estimate: 10 000; actual: 10 712.25

3. a) 25 **b)** 91.09 **c)** 240
d) 75 **e)** 34 **f)** 12.1203

4. a) 2 **b)** 5
c) 8.2 **d)** 10.2
e) 3.2 **f)** 6.0

5. a) 57° **b)** 65° **c)** 69°

6. a) 11.18 ft **b)** 28.54 ft **c)** 18.58 m

7. a) 3 **b)** 2.9
c) 80 **d)** 13.8
e) 0.2

8. a) $\tan A = \frac{a}{c}$ **b)** $\cos C = \frac{a}{b}$
c) $\sin A = \frac{a}{b}$

9. a) Example: 65°
b) adjacent: DF; opposite: EF
c) cosine
d) about 66.4°
e) Example: My estimate was close.

10. b) $x \approx 10.61$
c) $x \approx 7.36$

7.1 Right Triangles, pages 308 to 321

On the Job 1 Check Your Understanding, pages 312 to 313

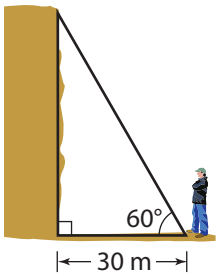
1. a) $\tan A = \frac{a}{b}$ **b)** $\tan B = \frac{b}{a}$

2. a) 27.7 units **b)** 21.1 units

3. a) estimate: 20 units; actual: 19.1 units
b) estimate: 19.5 units; actual: 19.0 units
c) estimate: 28 units; actual: 28.1 units

4. 311 m

5. a)



b) 52 m

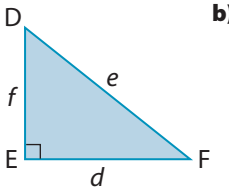
6. a) about 17.8 cm
b) Example: 110 pennants

On the Job 2 Check Your Understanding, pages 315 to 316

1. a) $\sin A = \frac{a}{c}$ **b)** $\sin S = \frac{s}{r}$
c) $\sin L = \frac{l}{n}$

2. Examples:

a)

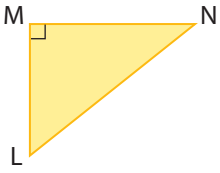


b) $\sin D = \frac{d}{e}$

3. a) estimate: 22 units; actual: 23.1 units
b) estimate: 7.5 units; actual: 8.2 units
c) estimate: 25 units; actual: 28.6 units
d) estimate: 200 units; actual: 202.9 units
4. 15 cm
5. 19.7 km
6. 6 ft
7. about 5.9 m
8. a) about 16.7 ft **b)** about 26.0 ft

On the Job 3 Check Your Understanding, pages 318 to 319

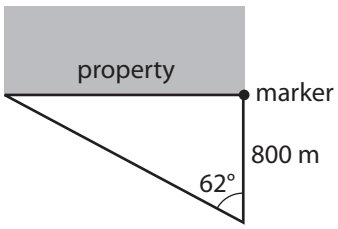
1. Example:
a)



b) MN **c)** LM
d) $\cos N = \frac{MN}{LN}$ **e)** $\cos L = \frac{LM}{LN}$
2. a) 24 units **b)** 36 units
c) 29 units **d)** 124 units
3. a) 41° **b)** 52°
c) 37°
4. 55°
5. a) about 55° **b)** about 35°
6. about 2.9 m

Work With It, pages 320 to 321

1. a) Sonja knows the length of the side adjacent to the known angle.



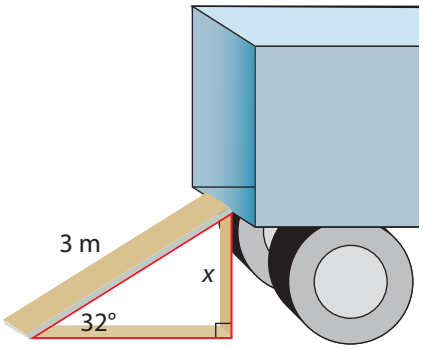
b) 1505 m
2. a) 59° **b)** 3 m
3. a) 12.0 km **b)** about 73°
4. a) Oliver used the sine ratio instead of the cosine ratio.
b) Example: Oliver can use either $\cos 23° = \frac{80}{AC}$ or $\sin 67° = \frac{80}{AC}$ to calculate the length of AC. His original equation gives an approximate length of 205 cm for AC, but from the diagram, AC should only be about 10% longer than BC.

5. Example: If Chelsea knows the lengths of the two legs of a right triangle, she must either use the Pythagorean relationship to find the hypotenuse before she can use the cosine ratio, or she can use the tangent ratio to solve for an unknown angle.

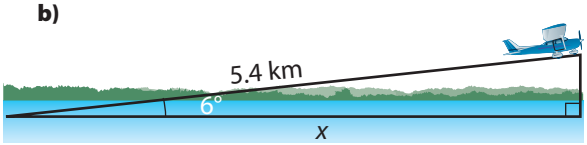
7.2 Angles of Elevation and Depression, pages 322 to 337

On the Job 1 Check Your Understanding, pages 326 to 327

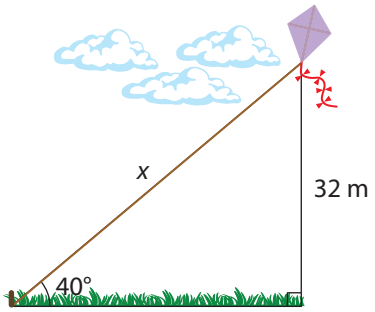
1. a) cosine ratio **b)** tangent ratio
c) tangent ratio **d)** tangent ratio
e) sine ratio **f)** sine ratio
2. a) 19 units **b)** 6 units
c) 30 units **d)** 49 units
e) 82 units **f)** 67 units
3. Examples:
a)



b)

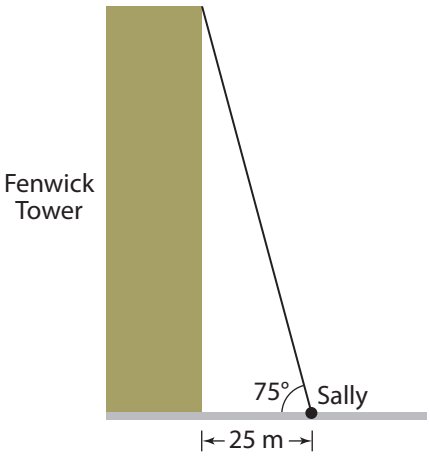


c)



4. a) sine ratio
b) cosine ratio
c) sine ratio
5. 18 m

6. a)



b) tangent ratio

c) Example: Sally's calculation could be inaccurate because of the limitations of clinometers. If the angle is actually 76°, the difference in Sally's height calculation is about 7 m.

7. a) 26-ft ladder

b) No. The 24-ft ladder can only reach the highest point of Orlando's house if it is at a 90° angle.

On the Job 2 Check Your Understanding, pages 330 to 331

1. a) tangent ratio **b)** tangent ratio
c) cosine ratio

2. a) 7 units **b)** 77 units
c) 77 units **d)** 71 units

3. a) sine ratio **b)** 20 ft

4. a) 15°; The sum of the angles in a triangle is 180°.
b) 22 m

5. a) about 17.2 m

b) No. The pole should be about 9.3 m in height.

6. a) estimate: 88 m

b) 95 m

c) Example: My estimate is low. I estimated tan 13° to be about 0.25, so the horizontal distance should be about four times the distance that the bridge is above the water.

On the Job 3 Check Your Understanding, pages 334 to 335

1. a) tangent ratio **b)** sine ratio
c) tangent ratio **d)** sine ratio

2. a) 42° **b)** 67°
c) 30° **d)** 43°

3. a) 89° **b)** 25°
c) 19° **d)** 53°

4. a) 12° **b)** 60°

5. a)

Playground Part	Safe Angle	Actual Angle (°)	Safe? (Yes/No)
Slide	Angle of depression of 50° or less	30°	Yes
Staircase to bridge	Angle of elevation of 35° or less	50°	No
Ramp	Angle of elevation of 7° or less	6°	Yes
Climbing ropes	Angle of depression of 75° or less	21°	Yes

b) The staircase to the bridge is too steep to be safe, but all of the other parts are safe.

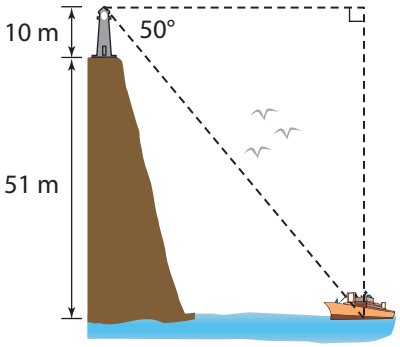
6. a) 450 ft/min **b)** 31°

Work With It, pages 336 to 337

1. a) No. It will only light about 6.3 m of the driveway.

b) Example: No. Lowering the angle of depression will more than double the distance lit, providing that the light is strong enough. Raising the light twice as high will double the distance lit.

2. a)



b) No. The boat is only about 51 m from shore.
Example:

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan 50° = \frac{61}{x}$$

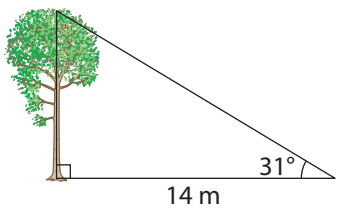
$$x(\tan 50°) = \left(\frac{61}{x}\right)x$$

$$\frac{x\tan 50°}{\tan 50°} = \frac{61}{\tan 50°}$$

$$x = \frac{61}{\tan 50°}$$

$$x = 51.185\ldots$$

3. a)

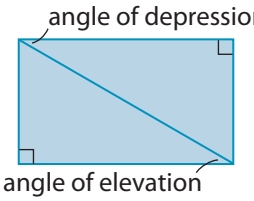


b) 8.4 m

4. a) No. Jessica's angle of depression and his angle of elevation should be the same.

b) Example: The horizontal distance between Weston and the tree and the height that Jessica is above the ground may be the easiest measurements to use.

5. The angle of depression and the angle of elevation are the same, as illustrated below.



6. a) Jody means that the angle of depression and the angle of elevation add to total 90°.

b) Jody's statement is only correct if the angle of depression and the angle of elevation are 45°. The angle of depression is always equal to the angle of elevation.

7. Examples:

a) Since cos 25° is approximately equal to 0.25, the base of the ladder should be about 30×0.25, or $7\frac{1}{2}$ ft from the wall. The distance from the wall should be about $\frac{1}{4}$ of the length of the ladder.

b) The base of the ladder should be about 24×0.25, or 6 ft from the wall.

7.3 Multiple Right Triangles, pages 338 to 353

On the Job 1 Check Your Understanding, pages 342 to 343

1. a) 55 **b)** 46

2. a) 108 **b)** 87 **c)** 195

3. a) 183 **b)** 140 **c)** 246

4. a) 105 **b)** 113

5. a) about 27° **b)** about 4 m

6. a) sine ratio **b)** sine ratio

c) wire A: 12 m; wire B: 11 m

7. a) There are two right triangles.

b) Example: 200 ft

c) 188 ft

d) Example: This answer is reasonable when you compare the heights of the two buildings.

On the Job 2 Check Your Understanding, pages 346 to 347

1. a) 54° **b)** 60°

c) 54° **d)** 29°

2. $\theta_1 \approx 40°, \theta_2 \approx 58°$

3. a) $\theta_1 \approx 36°, \theta_2 \approx 32°$

b) $\theta_1 \approx 36°, \theta_2 \approx 60°$

c) $\theta_1 \approx 51°, \theta_2 \approx 29°$

4. a) about 57°

b) about 57°

c) Yes. The answers are the same because the rise and run are the same.

5. No. The model's wings make an angle of about 49° with the body, and the model's tail makes an angle of about 55° with the body.

On the Job 3 Check Your Understanding, pages 350 to 351

1. a) $x \approx 25, y \approx 18$

b) $x \approx 36, y \approx 82$

c) $x \approx 100, y \approx 120$

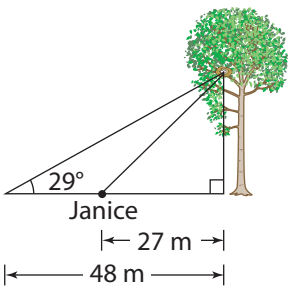
d) $x \approx 10, y \approx 23$

2. a) $\theta_1 \approx 57°, \theta_2 \approx 37°$

b) $\theta_1 \approx 51°, \theta_2 \approx 24°$

c) $\theta_1 \approx 44°, \theta_2 \approx 62°$

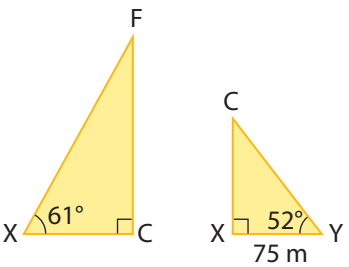
3. a)



b) two **c)** 27 m

4. a) two

b)



c) about 96 m **d)** about 96 m

e) CF **f)** about 173 m

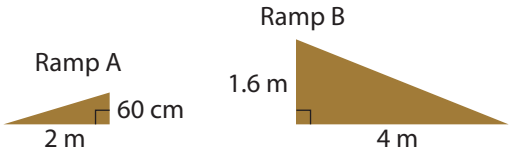
g) Example: Yes, because CF appears to be a bit less than twice the length of CX.

5. a) four **b)** about 36°

c) $x \approx 6.01$ m, $y \approx 10.23$ m

Work With It, pages 352 to 353

1. Examples:
Step 2:



Step 3: Ramp A: about 17°, Ramp B: about 22°
Step 4: 2 : 5

2. a) Example: They could each use the tangent ratio to see how far each of them is from the flagpole, and then add their distances; they could each measure how far they are from the flagpole, and then add their distances.
b) about 22.7 m

3. a) 24 m
b) Example: She could use the tangent ratio, and the angle in the triangle that measures 26°.

4. a) Example: Use the Pythagorean relationship to determine the length of AC, and then use the tangent ratio to determine the length of BC.
b) BC ≈ 19.2 cm

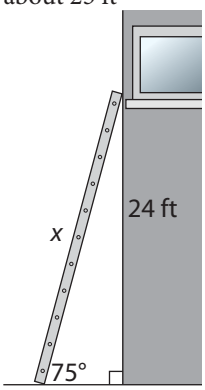
5. a) Example: Use the tangent ratio in △ABC to determine the length of AB, then use the tangent ratio in △ABD to determine the length of BD, and finally subtract the length of BC from BD to get the length of DC.
c) DC ≈ 12.4 cm
d) Example: The plan that has the fewest steps might be preferred.

Chapter 7 Skill Check, pages 354 to 355

1. a) 9.1 in. **b)** 12.9 ft **c)** 27.7°

2. 375.3 cm

3. about 25 ft



Example:

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\sin 75° = \frac{24}{x}$$

$$x(\sin 75°) = \left(\frac{24}{x}\right)x$$

$$\frac{x \sin 75°}{\sin 75°} = \frac{24}{\sin 75°}$$

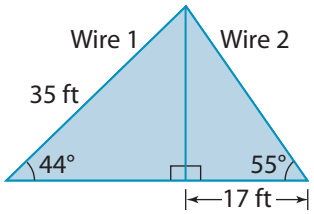
$$x = \frac{24}{\sin 75°}$$

$$x = 24.846\ldots$$

4. No. For the given position of the hay elevator and loft, the angle of elevation needed is about 33°.

5. a) about 41°
b) about 34°

6. a)

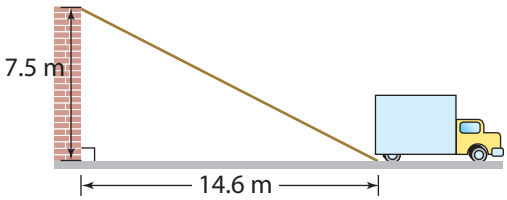


b) Using the triangle for wire 1, the height of the antenna is about 24 ft.
c) Using the triangle for wire 2, the height of the antenna is about 24 ft.

Chapter 7 Test Yourself, pages 356 to 357

1. C
2. C
3. C
4. C

5. a)



b) about 27°
c) 16.4 m

6. about 661.6 m

7. a) about 13.3 m **b)** about 8.7 m
c) about 9.8 m **d)** 23 m